



Arlington Conservation Commission

Date: Thursday, February 15, 2024

Time: 7:00 PM

Location: Conducted by Remote Participation.

Please register in advance for this meeting. Reference materials, instructions, and access information for this specific meeting will be available 48 hours prior to the meeting on the Commission's agenda and minutes page. This meeting will be conducted in a remote format consistent with Chapter 2 of the Acts of 2023, which further extends certain COVID-19 measures regarding remote participation in public meetings until March 31, 2025. Please note: Not all items listed may in fact be discussed and other items not listed may be brought up for discussion to the extent permitted by law. This agenda includes those matters which can be reasonably anticipated to be discussed at the meeting.

Agenda

1. Administrative

a. Correspondence Received.

- GM Hakin - Edith Street - Flood Photos, Edith Street Area.
- Elaine Lyte – 53 Dorothy Road – Thorndike Place and flooding.
- Brian Mariano – Melrose Street – Thorndike Place Comment.
- Coalition to Save the Mugar Wetlands – Thorndike Place, Hearing Feb 1. Response (1 of 2).
- Coalition to Save the Mugar Wetlands – Thorndike Place, Hearing Feb 1. Response (2 of 2).
- Lisa Fredman – 63 Mott Street – Continuing concerns about Thorndike Place and flooding.
- ALT letter to Con Com 2-10-2024.

All correspondence is available to the public. For a full list, contact the Conservation Agent at concomm@town.arlington.ma.us.

Specific correspondence for Thorndike Place is available at: <https://bit.ly/49w8tC5>.

2. Discussion

- a. Inland Wetland District Discussion
- b. Water Bodies Working Group.
 - i. SWCA Spy Pond Contract – Discussion & Vote
- c. Approve Use of Bylaw Expense Account for Conservation Administrator Salary.
- d. Ratify Enforcement Order Amendment: 66-66R Dudley Road.
- e. DEP #091-0326: Request for Permit Amendment: Arlington DPW Culvert Repair Project.
- f. Unpermitted Activity: 35 Beverly Road.

- g. Parks & Recreation Commission Liaison (next meeting 2/27/24).
 - h. Artificial Turf Study Committee Update (next meeting 2/20/24).
 - i. Escrow Agreement: 34 Dudley Street Signatures Needed.
3. Hearings

DEP #091-0357: Notice of Intent: 51 Burch Street (Continuation from 2/1/2024)

This public hearing will consider a Notice of Intent to demolish a single-family dwelling and construct a two-family dwelling and associated site appurtenances at 51 Burch Street within Bordering Land Subject to Flooding.

DEP #091-0356: Notice of Intent: Thorndike Place (continued from 2/1/2024)

The Conservation Commission will hold a public hearing under the Wetlands Protection Act to consider a Notice of Intent for the construction of Thorndike Place, a multifamily development on Dorothy Road in Arlington. This hearing will be limited to discussion regarding the third party stormwater peer review.

DEP #091-0278: Amendment to Order of Conditions: 88 Coolidge Road (Continued from 12/21/2023)

This public hearing will consider the peer review report for an amendment to an Order of Conditions for construction of a new house at 88 Coolidge Road in the Buffer Zone to a Bordering Vegetated Wetland.



Town of Arlington, Massachusetts

Correspondence Received

Summary:

Correspondence Received.

- GM Hakin - Edith Street - Flood Photos, Edith Street Area.
- Elaine Lyte – 53 Dorothy Road – Thorndike Place and flooding.
- Brian Mariano – Melrose Street – Thorndike Place Comment.
- Coalition to Save the Mugar Wetlands – Thorndike Place, Hearing Feb 1. Response (1 of 2).
- Coalition to Save the Mugar Wetlands – Thorndike Place, Hearing Feb 1. Response (2 of 2).
- Lisa Fredman – 63 Mott Street – Continuing concerns about Thorndike Place and flooding.
- ALT letter to Con Com 2-10-2024.

All correspondence is available to the public. For a full list, contact the Conservation Agent at concomm@town.arlington.ma.us.

Specific correspondence for Thorndike Place is available at: <https://bit.ly/49w8tC5>.

ATTACHMENTS:

Type	File Name	Description
□ Reference Material	GM_Hakin_-_Flood_Photos_Edith_Street_Area.pdf	GM Hakin - Flood Photos Edith Street Area
□ Reference Material	Elaine_Lyte_-_53_Dorothy_Road_-_Thorndike_Place_and_flooding.pdf	Elaine Lyte - 53 Dorothy Road - Thorndike Place and flooding
□ Reference Material	Brian_Mariano_-_Melrose_Street_-_Thorndike_Place_Comment.pdf	Brian Mariano - Melrose Street - Thorndike Place Comment
□ Reference Material	Coalition_to_Save_the_Mugar_Wetlands_-_Thorndike_Place_Hearing_Feb_1_Response_(1_of_2).pdf	Coalition to Save the Mugar Wetlands - Thorndike Place Hearing Feb 1 Response (1 of 2)
□ Reference Material	Coalition_to_Save_the_Mugar_Wetlands_-_Thorndike_Place_Hearing_Feb_1_Response_(2_of_2).pdf	Coalition to Save the Mugar Wetlands - Thorndike Place Hearing Feb 1 Response (2 of 2)
□ Reference Material	Lisa_Fredman_-_63_Mott_Street_-_Thorndike_Place_and_flooding.pdf	Lisa Fredman - 63 Mott Street - Thorndike Place and flooding
□ Reference Material	Arlington_Land_Trust_letter_to_Con_Com_2-10-2024.pdf	Arlington Land Trust letter to Con Com 2-10-2024

Flood Photos - Edith Street Area

GM <gm.hakim@gmail.com>

Sun 2/4/2024 9:41 PM

To:ConComm <ConComm@town.arlington.ma.us>

0 1 attachments (39 KB)

IMG_20240204_201816_01.jpeg;

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Hi Conservation Commission,

In keeping with the opposition to the proposed development in the Mugar Wetlands, this is a photo of 84-86 Margaret Street on January 10, 2024 after the storm. The photo is taken from the Minuteman Bikeway, and you can see the standing water (pond!) actually touching the house.

It's obvious that if this is happening in 2024, there is no way that an additional development of this scale will be sustainable in the long term.

I'm a resident of Edith Street, and have been since 2019. I hope this helps in some way.

~GM Hakim (He/Him)

Voice Actor

GMHakimVO@gmail.com

Listen to my [voiceover demos](#).

Read [my writing](#).

Or, [play D&D with me](#).



Re: Thorndike Place and flooding

ELAINE LYTE <lyte46@verizon.net>

Wed 2/7/2024 7:44 AM

To:ConComm <ConComm@town.arlington.ma.us>

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Dear Conservation Committee members,

You've received many photos of flooded streets, driveways, lawns, etc. in the neighborhood near the proposed Thorndike Place development. Below is a photo showing one of the impacts of the flooding inside my home. Over time cracks like this appear and expand. Door frames go out of true. Mold threatens our health. Sump pumps and dehumidifiers are insufficient.

Please stop this development from further endangering our homes and health.

Elaine Lyte
53 Dorothy Rd.



Sent from my iPad

5 of 291

On Jan 16, 2024, at 9:50 AM, ELAINE LYTE <lyte46@verizon.net> wrote:

Dear Conservation Committee Members,

I live at 53 Dorothy Rd in Arlington. Since buying my first-floor condominium in 2005, I have experienced flooding many times. In addition to routinely clearing storm drains, my upstairs neighbors and I installed multiple sump pumps, drainpipe extenders, and a drainage channel. When these measures proved insufficient, we returned to sandbagging to keep the water out.

I am not asking the Commission to solve this problem for us. I know that is not within your charter. I ask you to stop the Thorndike Place development from exacerbating the flooding and putting our homes are greater risk.

Thank you,
Elaine Lyte
53 Dorothy Rd.

Sent from my iPad

Re: Thorndike Place Comment

Brian Mariano <bmm0623@gmail.com>

Thu 2/8/2024 11:59 AM

To:Ryan Clapp <rclapp@town.arlington.ma.us>

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Thank you Ryan, I was at the last meeting and will continue to make efforts to show up. I have worked in agriculture for the last few years and as I learn more, large scale management of land and forests continues to be very interesting to me. I recently attended a webinar where there were some interesting programs and cost shares available. Not sure if this is something of interest for yall but wanted to pass along if it was... the DCR opened up a new forestry management program called the [Forest Stewardship Program](#). It is brand new, and in conjunction with the NRCS [Conservation Stewardship Program](#), it seems like there are several ways to pay for practices for forest stand management.

On Thu, Feb 8, 2024 at 11:00 AM Ryan Clapp <rclapp@town.arlington.ma.us> wrote:

Received, thank you. Your written comments will be uploaded onto the agenda and will be entered into the record. I invite you to make a public comment during that section of our next hearing on 2/15/24, if you would like.

Ryan Clapp
Conservation Administrator

Town of Arlington
Department of Planning and Community Development
730 Massachusetts Avenue Annex
Arlington, Ma 02476
(781)-316-3090

From: Brian Mariano <bmm0623@gmail.com>
Sent: Wednesday, February 7, 2024 8:53 AM
To: ConComm <ConComm@town.arlington.ma.us>
Subject: Thorndike Place Comment

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Hello,

My name is Brian Mariano, I have lived on Melrose Street since 2017. I want to email about the Thorndike Place hearings that have been taking place. I am new to the scene and am learning how much has happened over a long period of time, and while I am bummed to have missed so much, I am energized and opposed to this proposal.

I am aware of the nuance involved in these kinds of things, realizing that I would also likely have opposed the development of much of East Arlington with the lens that every effort should be made to preserve and cultivate these natural resources we have around us. Our ecoregion and what it offers; I believe the wetlands that surround us are the sponge that helps absorb and filter water, roots that build soil, trees and perennials that store carbon and feed and house wildlife. And I think losing or disrupting more of that with further development is a detriment to the future generations of humans and non-humans who call, or would call this area home.

As someone who is ecologically, agriculturally focused, I see so much beauty in the 17 acres there. I run around there often and dream about clearing the overgrown brush and invasive species, managing downed trees as water retention or wildlife habitat, boardwalks and pathways, herons and turtles, cultivating and planting wildflowers and shrubs and berries and all that! However when I see "Private Property" signs and see the neglect in this area, it is saddening because there is so much potential there.

Thank you for reading. Please let me know if there is anything I can do to support this further or things to look for in the future.

Thanks and have a great day,
Brian Mariano

Thorndike Place - Hearing Feb. 1 Response

Coalition to Save the Mugar Wetlands <savethemugarwetlands@gmail.com>

Wed 2/7/2024 7:59 PM

To:ConComm <ConComm@town.arlington.ma.us>

Cc:Jim Feeney <jfeeney@town.arlington.ma.us>;SAdmin <SAdmin@town.arlington.ma.us>;info@arlingtonlandtrust.org <info@arlingtonlandtrust.org>

 1 attachments (31 KB)

Con Comm Letter 224.docx;

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

To Members of the Conservation Commission:

Attached please find our response to the Feb. 1 hearing of the proposed Thorndike Place project.

Thank you,

Jeanette Cummings
32 Dorothy Rd.

Julie DiBiase
29 Littlejohn St.

On Behalf of the Coalition to Save the Mugar Wetlands



February 7, 2024

To Members of the Conservation Commission:

After attending the Conservation Commission hearing on Thursday, February 1st regarding the proposed Thorndike Place development, we would like to address several alarming issues raised by Hydrologist, Scott Horsley.

1. Inconsistent Groundwater Levels

Questions surrounding the accuracy of the groundwater levels provided by the Applicant are concerning due to the fact that this may have a direct impact on the function of the proposed stormwater management system, leading to increased groundwater levels and surface flooding.

2. Groundwater Mounding

The Applicant's calculations of groundwater mounding significantly underestimates the effects associated with the proposed stormwater infiltration system. The calculations provided in the Stormwater Report for the primary infiltration structure were based on a duration of 0.046 days or 1.1 hours, whereas MADEP Stormwater Standards require a minimum of 24-hours. The inadequacy of the Applicant's model clearly does not represent the full impact of a 24-hour storm event, whereby the use of the longer infiltration time will result in significantly higher groundwater mounding than reported.

3. Well Monitoring

Questions remain regarding the monitoring of the wells installed on the site. Ideally, such wells should be monitored in the spring when groundwater is the highest. *We ask the Con Comm to confirm that the wells are being regularly monitored, into the spring months, that the data gathered is being submitted and made publicly available.*

4. Climate Change

Neighbors continue to voice their concerns regarding ongoing flooding issues that will only be exacerbated by climate change. *The Con Comm needs to request detailed data and a plan for storm water mitigation that also addresses the expected impacts of climate change.*

5. Recommendations

We respectfully ask the Con Comm to follow all of Scott Horsley's recommendations detailed in his report.

In conclusion, Scott Horsley provided extensive information concerning the validity of the data submitted by the Applicant. **With the long history of flooding and vulnerability of this site, every means available should be utilized to provide accurate information** - the protection of existing homes, property and wetlands are at stake. The question, "**Where is the water going to go?**" still remains....

Thank you on Behalf of the Coalition to Save the Mugar Wetlands,

Jeanette Cummings, 32 Dorothy Rd.
Julie DiBiase, 29 Littlejohn St.

Cc: James Feeney, Arlington Town Manager
David Morgan, Environmental Planner/Conservation Agent
Arlington Select Board
Arlington Land Trust

Re: Thorndike Place - Hearing Feb. 1 Response

Coalition to Save the Mugar Wetlands <savethemugarwetlands@gmail.com>

Fri 2/9/2024 8:19 PM

To:Ryan Clapp <rclapp@town.arlington.ma.us>;ConComm <ConComm@town.arlington.ma.us>
Cc:SBadmin <SBadmin@town.arlington.ma.us>;info@arlingtonlandtrust.org <info@arlingtonlandtrust.org>;Jim Feeney <jfeeney@town.arlington.ma.us>;Christian Klein <cmqklein.alist@gmail.com>

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Hi Ryan,

Thank you for confirming receipt of the Coalition's letter dated Feb. 7th in response to the last hearing of Feb. 1st.

To our knowledge wells were installed last summer on the site for Thorndike Place - please see recent photo below.



As referenced in our letter, comment #3 asks the Con Comm to **confirm the monitoring of the installed wells**, in the spring months, that the **data gathered be submitted and made publicly available**.

Is the Con Comm not aware of the existence of these wells?

Per the Order of Conditions from the Comprehensive Permit (see pages 45 and 61 below), in addition to test pits, it's mandatory that wells be installed and monitored, witnessed by the Town and/or its agent, during the spring when seasonal high groundwater levels are likely to be at their highest.

P. 45 C.2 k.

Utilizing the methods detailed in Condition I.17, the Applicant shall perform additional test pits at the proposed stormwater basins to confirm groundwater elevations during seasonal high groundwater conditions as confirmed by monitoring nearby USGS wells. These test pits shall be witnessed by the Town and/or its agent. Should revisions to the infiltration system design be required based on additional

11 of 291

groundwater investigations, revised plans and stormwater calculations will be provided to the Department of Planning and Community Development for review prior to the issuance of building permits.

P. 61 I.17

In addition to the provisions of Condition C.2.k, the Applicant shall, through documentation to be submitted to the Board for review, establish seasonal high groundwater elevations at the Property to ensure that there is a minimum of a two-foot separation between the bottom of the stormwater management infiltration chambers and the seasonal high groundwater table. The Applicant shall provide proposed locations and number of test pits and wells to the Board for review and administrative approval. Seasonal high groundwater shall be established based on Volume 2, Chapter 2: Structural BMP Specifications for the Massachusetts Stormwater Handbook, with specific requirements, as follows “Estimate seasonal high groundwater based on soil mottles or through direct observation when borings are conducted in April or May, when groundwater levels are likely to be highest. If it is difficult to determine the seasonal high groundwater elevation from the borings or test pits, then use the Frimpter method developed by the USGS (Massachusetts/Rhode Island District Office) to estimate seasonal high groundwater. After estimating the seasonal high groundwater using the Frimpter method, re-examine the bore holes or test pits to determine if there are any field indicators that corroborate the Frimpter method estimate.”

Who is responsible for making sure the conditions are being adhered to?

As a point of reference, one of BSC Group's completed projects listed on their website is Cambridge Discovery Park, located on Route 2 directly across from the Mugar site. The photo below of the project and excerpt is taken directly from their website:

This project required a stormwater management strategy designed to compensate for displacement of floodwaters caused by the project improvements. Underground chambers were designed for the temporary storage of these floodwaters which then flow through the creative storm water ponds.



As compared to photos taken of the same site during the recent storm on Jan. 10, 2024 - Is this what our future holds?



Thank you,

Jeanette Cummings
32 Dorothy Rd.

Julie DiBiase
29 Littlejohn St.

On Behalf of the Coalition to Save the Mugar Wetlands

On Feb 8, 2024, at 3:06 PM, Ryan Clapp <rclapp@town.arlington.ma.us> wrote:

Received, thank you. Your written comments will be uploaded onto the agenda and will be entered into the record. I invite you to make a public comment during that section of our next hearing on 2/15/24, if you would like.

As a point of clarification, your Comment #3 makes reference to monitoring wells. There are no monitoring wells associated with or installed onsite for Thorndike Place - they were test pits measured at a single point in time, and are not continuously monitored.

Thank you,

Ryan Clapp
Conservation Administrator

Town of Arlington
Department of Planning and Community Development
730 Massachusetts Avenue Annex
Arlington, Ma 02476
(781)-316-3090

From: Coalition to Save the Mugar Wetlands <savethemugarwetlands@gmail.com>
Sent: Wednesday, February 7, 2024 7:58 PM
To: ConComm <ConComm@town.arlington.ma.us>
Cc: Jim Feeney <jfeeney@town.arlington.ma.us>; SBadmin <SBadmin@town.arlington.ma.us>; info@arlingtonlandtrust.org<info@arlingtonlandtrust.org>
Subject: Thorndike Place - Hearing Feb. 1 Response

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

To Members of the Conservation Commission:

Attached please find our response to the Feb. 1 hearing of the proposed Thorndike Place project.

Thank you,

Jeanette Cummings
32 Dorothy Rd.

Julie DiBiase
29 Littlejohn St.

On Behalf of the Coalition to Save the Mugar Wetlands

Continuing concerns about proposed Thorndike Place and flooding

Lisa Fredman <lfredman1@gmail.com>

Fri 2/9/2024 10:17 PM

To:ConComm <ConComm@town.arlington.ma.us>

1 attachments (6 MB)

Flooding between Edith St. and Thorndike Field_020724.jpg;

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Dear Conservation Commission members,

Thank you for the excellent presentation by Scott Horsley and the probing questions raised by ConComm members at the February 1 meeting on the proposed Thorndike Place development.

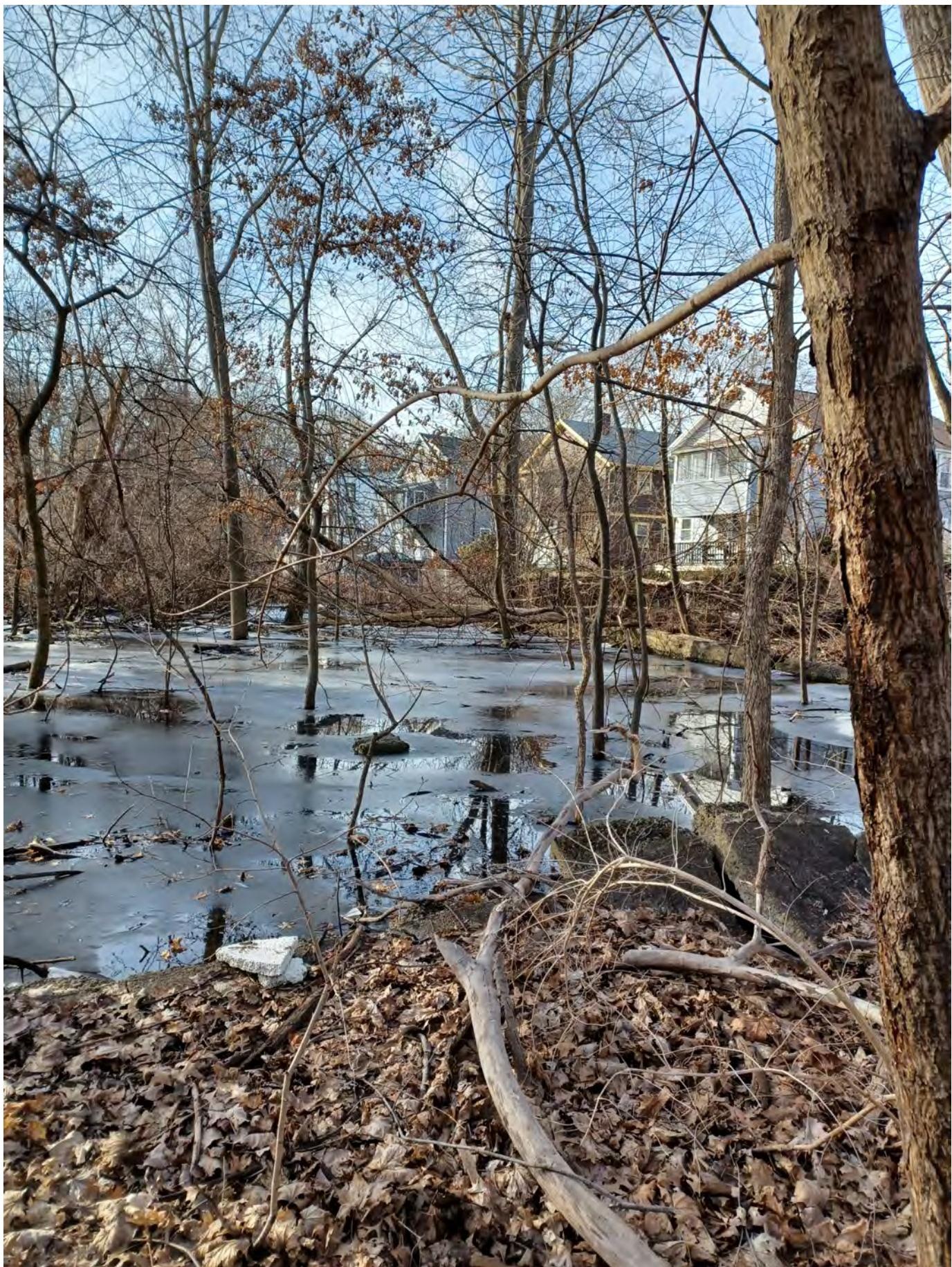
I have been thinking a lot about Ms. Chapnik's question, "where is all the water going to go?" The answer for winter 2023-24 is "it stays." Attached is a photo of flooding between Edith Street and Thorndike Field, taken on Feb. 7, to add to my previously-sent photos of flooding in this area, taken on Dec. 25, 2023 and Jan. 10, 2024: it is clear that the water is staying.

A logical follow-up to Ms. Chapnik's question is "if Thorndike Place is built, where will all the water be going 10- or 20-years from now?" A recent Boston Globe article noted that Boston has had 9 inches of rain since January, and rainier winters are likely to continue (see <https://www.bostonglobe.com/2024/02/02/metro/boston-weather-rainfall-snow-winter-season/>). Clearly, water problems are increasing due to climate change. I am glad that the ConComm members asked the developer to provide more detailed plans for flooding remediation, but I am concerned about the narrow focus on sump pumps and basements. If Thorndike Place is built, the groundwater will likely stay around longer, making Thorndike Field soggy and less usable for soccer and other recreational activities, exacerbating the flooding problems in our neighborhood, and bringing more mosquitos and mosquito-borne diseases, such as EEE, to East Arlington. The fundamental question is "do we want to leave that legacy to our neighbors and our Town?" I hope not. And I hope the ConComm members agree by rejecting the proposed Thorndike Place development.

Sincerely,

Lisa Fredman

63 Mott Street





Officers February 10, 2024

President

Christopher Leich Charles Tirone, Chair
Conservation Commission

Vice President

Clarissa Rowe concomm@town.arlington.ma.us

Clerk

Ann LeRoyer Dear Mr. Tirone,

Treasurer

John F. Page

Directors

Nellie Aikenhead
Peter Belknap
Lolly Bennett
Nora Frank
Carol Kowalski
Bancroft Poor
Ted Siegan

The Arlington Land Trust strongly endorses the recommendations contained in Scott Horsley's letters of November 13, 2023 and February 9, 2024 regarding the proposed Thorndike Place project, and his presentation to the Commission on February 1, 2024. As Mr. Horsley has explained, it is imperative for groundwater levels at the project site to be measured accurately, and for mounding effects to be correctly modeled, in accordance with the requirements of the Massachusetts DEP Stormwater Handbook.

The haphazard data provided by the Applicant so far do not provide a reason to believe that any adequate stormwater management system can be designed for this project, let alone that the design provided by the Applicant will work. In the absence of an adequate stormwater system, the adjacent wetlands will be adversely affected, and the proposed "conservation parcel" severely damaged, in contravention of the Massachusetts Wetlands Protection Act.

We urge the Commission to require the Applicant to follow the procedures outlined by Mr. Horsley **now**, over the course of this coming March, April, and May, and to closely monitor the Applicant's compliance with these procedures through the involvement of the Town or its agents. An issue so central to the viability of the whole project should not be left to a later date.

Thank you for your continued close examination of this controversial project.

Very truly yours,
Arlington Land Trust, Inc.

Christopher M. Leich
President

cc: James Feeney
Christian Klein
Claire Ricker
Michael Cunningham, Esq.
Sen. Cindy Friedman
Rep. Dave Rogers
Rep. Sean Garballey



Town of Arlington, Massachusetts

Water Bodies Working Group

Summary:

Water Bodies Working Group.

- i. SWCA Spy Pond Contract – Discussion & Vote

ATTACHMENTS:

Type	File Name	Description
<input checked="" type="checkbox"/> Reference Material	68573-003_Spy_Pond_2024_Survey_and_Management_SWCA-Services_Agreement.pdf	68573-003 Spy Pond 2024 Survey and Management SWCA-Services Agreement

This Services Agreement ("Agreement") is entered into effective as of the 12 day of February, 2024 by and between SWCA, Incorporated, an Arizona corporation doing business as SWCA Environmental Consultants ("SWCA"), and the client identified below ("Client") (or each entity individually "Party" and collectively "Parties"). SWCA and Client agree as follows:

BASIC TERMS

Client Information

Client (complete legal name): The Town of Arlington

Client's State of Incorporation/Organization: MA

Street Address: 730 Massachusetts Ave

City: Arlington

State: MA

Zip Code: 02474

Main Client Contact Name: David Morgan

Send Invoices to Main Address / Billing Contact:

Email: dmorgan@town.arlington.ma.us

Send Invoices via Email: dmorgan@town.arlington.ma.us

Phone:

Send Invoices to Alternate Billing Address (below)

Fax:

Billing Contact:

Street Address:

City: State: Zip Code:

Phone: Email:

Basic Project Information

Project Title: 2024 Spy Pond Survey and Management

Project Number: 00068573-003-AMH

Project County: Middlesex

Project Manager: Naomi Valentine

Project City: Arlington

Project State: MA

Scope of Services

The services to be provided by SWCA hereunder (the "Services") are described as follows or in a document attached to this Agreement and referred to as the "Statement of Work" or "SOW" (which may be labeled as Exhibit A). As used herein, the term "Agreement" refers to this Agreement and any related SOWs, together with the attached Services Agreement General Terms, each incorporated herein by this reference.

Work Schedule

Estimated Start Date: The estimated date by which SWCA is expected to begin performing the Services ("Estimated Start Date") is as follows (check applicable box): as described in SOW or , 20 .

Estimated Completion Date: The estimated date by which SWCA is expected to complete the Services ("Estimated Completion Date") is as follows (check applicable box): as described in SOW or , 20 .

SWCA's Fees

The fees payable for the Services shall be as follows (check applicable box):

- \$ "Fixed Fee" basis for the Services described in the Statement of Work.
- \$41,505.00 "Time and Materials, Not-To-Exceed", at rates quoted in the SWCA Rate Schedule which may be labeled as Exhibit B.
- \$ "Time and Materials" (estimated contract value; no ceiling) at rates quoted in the SWCA Rate Schedule which may be labeled as Exhibit B.

- \$ N/A "Time and Materials On-Call" at rates quoted in the SWCA Rate Schedule which may be labeled as Exhibit B.
- \$ per unit, not to exceed \$ total contract value "Unit Fee Max" (eg: per day; with contract ceiling) at rates quoted in the SWCA Rate Schedule which may be labeled as Exhibit B.
- \$ per unit "Unit Fee On-Call" (eg: per day; estimated contract value; no ceiling).

Sales Tax (check applicable box)

- Sales Taxes are NOT included in the contract value specified above, if any (i.e., Sales Taxes will be billed to Client in addition to the specified contract value).
- Sales Taxes are included in the contract value specified above, if any.
- Sales Taxes not applicable.

Invoicing and Payment

Deposit: Client agrees to provide SWCA with a deposit of \$0.00 promptly upon Client's execution of this Agreement as an advance deposit towards payment of fees and any reimbursable expenses payable under this Agreement. If Client does not provide such deposit, SWCA may delay beginning work until such deposit is received or may terminate this Agreement by written notice to Client. The deposit may be applied to amounts currently due to SWCA and unpaid or SWCA may hold the deposit and apply it to the final invoice(s).

Reimbursement of Expenses: Client shall reimburse SWCA for expenses as described in the SOW and in SWCA's Rate Schedule which may be labeled as Exhibit B as referenced above.

Payment Terms: SWCA shall invoice Client monthly for services rendered (based on percentage of completion/hours expended, as applicable) and expenses incurred. Invoices are payable within 10 days of Client's receipt of payment from its client, but in no case any longer than 75 days from the invoice date. Overdue amounts bear interest at the rate of 1.5% per month until paid and are subject to a monthly late-payment service charge equal to the greater of \$200 or 1% of the overdue balance.

Manner of Payment: Unless a different manner of payment is requested by SWCA, payments are to be remitted as follows:

- *Preferred Payment Method:* ACH/EFT: Routing number – 071922777; Account number – 7811583501; Account Type – Business Checking; Bank Name – First American Bank; Location: - Carol Stream, Illinois. Submit remittance advice to payment@swca.com.
- *Alternate Payment Method:* Via check mailed to: P.O. Box 7217, Carol Stream, IL 60197-7217.

Acceptance

If this Agreement is not returned to SWCA duly executed on behalf of Client within thirty (30) days from Client's receipt of this Agreement, SWCA may rescind this Agreement by written notice to Client. This Agreement may be signed in counterparts and may be signed or delivered electronically.

Special Terms

In addition to the Basic Terms set forth above, and General Terms set forth below, the Parties agree to the terms set forth in the following Special Terms (none if blank). In case of a conflict, the Special Terms shall take precedence.

n/a

SWCA, Incorporated

Client:

By:

(signature)

By:

(signature)

Name:

Name:

Title:

Title:

Date:

Date:

SERVICES AGREEMENT GENERAL TERMS

The following General Terms apply to that certain Services Agreement between SWCA, Incorporated ("SWCA") and the client identified in said Services Agreement ("Client"). References to the "Basic Terms" mean the terms set forth above the signature line in such Services Agreement. References to the "General Terms" mean the terms set forth below. References to this "Agreement" mean the Basic Terms together with the General Terms, including any "Special Terms" above the signature line, together with any SOW executed by the Parties in connection with the Basic Terms. To the extent an SOW contains terms that are in addition to or different than these General Terms, the terms of the SOW shall govern.

1. Services

- 1.1 **Scope of Services.** Pursuant to the terms of this Agreement, SWCA shall provide those services that SWCA agrees in writing to provide under this Agreement ("Services") as set forth in the Basic Terms and in any applicable SOW. Any reports and similar materials that SWCA is required to deliver to Client as part of the Services are referred to as "Deliverables". References in this Agreement to the "Services" include any Deliverables related to those Services. References in this Agreement to the "Project" mean the project to which the Services relate.
- 1.2 **Subcontractors/Subconsultants.** Use of subcontractors or other subconsultants by SWCA to perform the Services are subject to Client's written approval. SWCA's obligations under this Agreement with respect to performance of the Services shall apply to any portions of the Services subcontracted by SWCA.

2. Work Schedule

- 2.1 **Start of Work.** Unless otherwise directed by Client, SWCA may start work before the Estimated Start Date where necessary or helpful for the prompt completion of the Services but an early start shall not change any Estimated Completion Date unless otherwise mutually agreed in writing.
- 2.2 **Completion of Work.** It is acknowledged that the Estimated Completion Date is an estimate and that SWCA shall not be responsible for delays caused by circumstances beyond SWCA's reasonable control. Client agrees to provide reasonable cooperation as necessary to enable the completion of Services.
- 2.3 **Work Delays.** It is acknowledged that this Agreement constitutes a commitment by SWCA to perform the Services and a commitment by Client to pay SWCA for the Services according to this Agreement, subject to the terms of this Agreement including terms allowing termination of this Agreement. Consequently, if Client directs SWCA not to start work or to suspend work or otherwise gives directions that restrict SWCA's performance of the Services, SWCA's following of such directions shall not limit SWCA's rights under this Agreement. Any Estimated Completion Date shall be extended to the extent of any delays caused by Client (e.g., delays due to requests by Client not to start work or to suspend work or due to Client's breach of this Agreement). In the event of cumulative delays in starting or continuing work of over 180 days that are caused by Client or otherwise due to circumstances beyond SWCA's reasonable control, SWCA may elect to terminate this Agreement by written notice to Client.

3. Changes in Scope of Services

- 3.1 **Additional Services.** Any services provided by SWCA for Client that are outside the scope of the Services under this Agreement (as defined in Section 1.1) shall constitute "Additional Services" under this Agreement (unless such services are the subject of a separate agreement executed by SWCA and Client in which event such services shall be governed by such other agreement). Additional Services provided by SWCA with Client's written approval shall constitute "Approved Additional Services" and shall be part of the Services under this Agreement.
- 3.2 **Payment for Additional Services.** SWCA shall be entitled to additional compensation for Approved Additional Services on such terms as are agreed on in writing by SWCA and Client. The following terms shall apply to Approved Additional Services unless otherwise agreed in writing by SWCA and Client: (i) SWCA shall be entitled to additional compensation for Approved Additional Services on an hourly basis at SWCA's then-current hourly rates for the services at issue, (ii) such additional compensation shall not count towards any not-to-exceed amount established as part of the original pricing and payment terms, and (iii) SWCA shall be entitled to expense reimbursement from Client with respect to the Approved Additional Services on terms consistent with expense reimbursement terms applicable to the Services.
- 3.3 **Reduction in Services.** If Client desires to reduce the scope of the Services, Client shall provide written notice to SWCA of the proposed changes in the scope of the Services and of any corresponding changes proposed by Client with respect to SWCA's compensation and related terms. If SWCA gives Client written notice that SWCA accepts such proposal, the terms of this Agreement shall be deemed amended in accordance with the accepted proposal.

3.4 **Subpoena Related Additional Services.** In the event that SWCA is required to spend time in response to a subpoena or similar legal requirement ("Subpoena") arising out of a dispute or legal action or investigation involving Client or the Project, the expenditure of such time shall constitute "Additional Services" hereunder. These terms do not apply to the extent that a dispute or legal action includes claims asserted against SWCA and the Subpoena is in furtherance of those claims. SWCA shall be entitled to reimbursement from Client with respect to expenses incurred in connection with Additional Services involving a Subpoena.

4. Standard of Service, Project Information and Deliverables

- 4.1 **Standard of Service.** SWCA shall perform the Services in compliance with applicable law, and in accordance with the level of care generally observed by similar companies providing the same services under similar circumstances ("Standard of Service"). SWCA's obligations with respect to the quality of the Services are subject to the terms of this Agreement and conditioned on SWCA's receipt of all undisputed amounts due to SWCA with respect to the Services at issue. SWCA shall not be responsible for the quality of any partially completed Services in the event SWCA is prevented from completing the Services due to Client's breach or other circumstances beyond SWCA's reasonable control. EXCEPT AS TO THE WARRANTIES SET FORTH HEREIN, CONTRACTOR AND ITS AGENTS, OFFICERS, DIRECTORS, EMPLOYEES, SUCCESSORS, ASSIGNS, AND AFFILIATES PROVIDE THE SERVICES AND DELIVERABLES "AS IS," AND MAKE NO REPRESENTATIONS OR WARRANTIES OF KIND, EXPRESS OR IMPLIED, AND DISCLAIM ALL WARRANTIES DERIVING FROM, RELATED TO, OR ARISING OUT OF TITLE, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE.
- 4.2 **Project Information.** SWCA shall be responsible for the accuracy of information prepared by SWCA as part of the Services as necessary for SWCA to conform to the Standard of Service. SWCA shall not be responsible for the accuracy of materials that were not prepared by SWCA (e.g., government records, materials provided by Client, third-Party maps and reports) except to the extent SWCA agrees in the SOW to be responsible for verifying the accuracy of those materials.
- 4.3 **Deliverables.** SWCA may withhold Deliverables contingent on payment for work relating to such Deliverables. Client's right to use any Deliverable is conditioned on Client's payment of all amounts due to SWCA.
- 4.4 **Confidentiality.** SWCA and Client shall use reasonable efforts to maintain the confidentiality of any non-public information relating to the other Party or the Project, including the terms of this Agreement and any SOW.
- 4.5 **Data Security.** SWCA acknowledges that it has reasonable information and cybersecurity policies and procedures in place that are designed and functioning in a manner to protect client/customer information. SWCA acknowledges and agrees that any client/customer information provided to SWCA by or on behalf of Client will be subject to such policies and procedures.
- 4.6 **Non-Interference with Employees.** Each party agrees not to hire or solicit, directly or indirectly, any employee or former employee of the other party for a period of the greater of a. one (1) year after the date of this agreement, or b. for a period of one (1) year after the expiration or termination of any future contract the parties may enter into, without the other party's prior written consent provided, however, that the foregoing restriction shall not apply with respect to former employees of such other party who have not been employed by such other party for the six (6) months prior to such hire or solicitation. However, notwithstanding the above, this section shall not restrict the right of either party to solicit or recruit generally in the media, and shall not prohibit either party from hiring, without prior written consent, the other party's employee who answers any advertisement or who otherwise voluntarily applies for hire without having been personally solicited by the hiring party.

5. Payment-Related Terms

- 5.1 **General Payment Terms.** General payment terms are set forth in the Basic Terms. Except as expressly agreed by SWCA in writing, payment to SWCA shall in no event be withheld by reason of Client not receiving payment from a third-Party.
- 5.2 **Fixed Fee and Not-To-Exceed Terms.** Except where a fixed fee or a not-to-exceed amount is mutually agreed in writing, any fee quotes are non-binding estimates. If SWCA agrees to a fixed fee or a not-to-exceed amount based on inaccurate or incomplete information provided by Client or other circumstances that are not SWCA's fault and, as a result, the assumptions relied upon by SWCA for the originally agreed upon fee limit are materially affected, the Parties shall negotiate in good faith to determine appropriate modifications in pricing and related terms.

- 5.3 **Late Payment.** In the event Client fails to pay any undisputed amounts to SWCA when due, SWCA shall have the right to stop work after giving Client written notice of the non-payment and the intention to stop work. In the event Client fails to pay any undisputed amounts to SWCA when due and does not cure such failure within three (3) business days from SWCA giving written notice of non-payment ("Payment Default"), SWCA's remedies shall include the right to: (i) suspend performance of the Services and withhold Deliverables until SWCA receives payment for all overdue and undisputed amounts and reasonable assurances of future payment; (ii) terminate this Agreement by providing written notice of termination to Client; and/or (iii) exercise other rights and remedies available under this Agreement or applicable law. In the event SWCA and Client are Parties to more than one agreement under which SWCA is obligated to provide services and Client fails to pay any amounts to SWCA when due under one services agreement, SWCA may treat that as a failure to pay under other services agreements. Undisputed overdue amounts bear interest at the rate of 1.5% per month until paid. Client shall reimburse SWCA for all reasonable attorneys' fees, court costs and other expenses incurred by SWCA (including any commissions payable to collection agencies) in connection with efforts to collect overdue amounts payable under this Agreement (including efforts to collect such attorneys' fees, court costs and other expenses).
- 5.4 **Reimbursable Expenses.** SWCA may, with Client's prior written approval, use subcontractors to complete the Services. Client shall reimburse SWCA for costs incurred in connection with the Services as provided in this Agreement. Subcontractor costs shall be subject to a 20% administrative fee and other costs shall be subject to a 15% administrative fee.
- 5.5 **Work Performed in Puerto Rico.** All SWCA labor physically performed in Puerto Rico shall be subject to Puerto Rico's then-current sales and use tax (currently 11.5%). However, if Client submits either 1) a 'Certificate for Exempt Purchases and for Services Subject to the 4% Special-SUT,' or 2) A 'Merchant Registration Certificate,' SWCA will charge a 4% sales and use tax on SWCA labor physically performed in Puerto Rico.

6. Term and Termination

- 6.1 **Term of Agreement.** Unless terminated earlier pursuant to the terms of this Agreement, this Agreement shall remain in effect until the Services that are the subject of this Agreement are completed. Upon completion of the Services, this Agreement shall automatically terminate subject to survival of specified terms as described below.
- 6.2 **Termination for Breach.** In the event either Party materially breaches this Agreement and does not cure such breach within ten (10) business days of receipt of a written notice the Party may terminate this Agreement by giving five (5) business days advance written notice of termination.
- 6.3 **Termination for Convenience.** Either Party may terminate this agreement upon thirty (30) days written notice.
- 6.4 **Payment Upon Termination.** If this Agreement terminates under any circumstances, SWCA's payment rights shall include the following: In the event of termination of this Agreement where the Services are priced on a fixed-fee basis, SWCA shall entitled to payment of all amounts due and unpaid based on the percentage of work completed prior to the effective time of termination as reasonably estimated by SWCA. In the event of termination of this Agreement where the Services are priced on a time and materials basis, SWCA shall be entitled to payment of all amounts due and unpaid based on the number of hours worked prior to the effective time of termination. SWCA shall also be entitled to reimbursement of expenses that are reimbursable under the terms of this Agreement and incurred prior to the effective time of termination.
- 6.5 **General Termination Provisions.** The termination rights provided in this Section 6 are in addition and without prejudice to other termination rights provided under this Agreement. In the event of termination of this Agreement, Client shall immediately deliver to SWCA all SWCA property that Client has possession or control of including any Deliverables that are not fully paid for. Upon termination of this Agreement, all provisions of this Agreement that expressly or by their nature continue in effect (e.g., payment terms, confidentiality provisions, liability limitations, indemnification obligations, and general terms) shall survive termination.

7. Remedies

- 7.1 **Attorneys Fees.** In the event of any litigation or dispute arising out of, or relating to the subject matter of, this Agreement, the non-prevailing Party shall reimburse the prevailing Party for its reasonable attorneys' fees and court costs incurred in connection with such litigation or dispute.
- 7.2 **Consequential Damages.** Neither Party shall be liable for any consequential, incidental, liquidated, or special (including multiple or punitive) damages of the other Party arising out of or in connection with this Agreement.

- 7.3 Indemnification. Each Party shall indemnify the other Party against any losses (including amounts reasonably paid for attorneys' fees) to the extent incurred as a result of the indemnifying Party's breach of this Agreement or as a result of any negligent acts or omissions attributable to the indemnifying Party. These indemnification rights and obligations do not limit any indemnification rights and obligations provided under applicable laws. However, in no event shall any indemnification rights and obligations impair any liability limitations provided under this Agreement.
- 7.4 Limitations. In no event shall SWCA have any liability for any adverse consequences that result from following the directions of Client. In addition, to the fullest extent permitted by law, and notwithstanding anything in this Agreement or an SOW to the contrary, SWCA's aggregate liability for any claims arising under or in connection with this Agreement or any related SOW shall not exceed the sum of all fees paid by Client to SWCA under the related SOW in the twelve (12) month period preceding the act or omission giving rise to such claim(s).

8. Insurance

- 8.1 SWCA shall provide, pay for, and maintain in force at all times during the performance of the Services insurance to protect itself from claims arising under Worker's Compensation; from claims for damages because of bodily injury including personal injury, sickness or disease or death of any person; from claims for damages resulting from injury to or destruction of property, including loss of use thereof; and from claims arising out of the performance of professional services.
- 8.2 SWCA shall provide, pay for, and maintain in force at all times during the performance of the services hereunder, insurance in compliance with the insurance coverage listed below.
- A. Workers' Compensation Insurance as may be required by all state and federal worker's compensation acts.
 - B. Employers' Liability Insurance with limits of at least One Million Dollars (\$1,000,000).
 - C. Commercial General Liability Insurance covering liabilities for death and personal injury and liabilities for loss of or damage to property with a combined single limit of One Million Dollars (\$1,000,000) per occurrence and Two Million Dollars (\$2,000,000) in the aggregate.
 - D. Umbrella Excess Liability Insurance written as excess of Employers' Liability, Commercial General Liability, and Business Automobile Liability, with limits of not less than Five Million Dollars (\$5,000,000) each occurrence, combined single limit.
 - E. Automobile Liability Insurance with a minimum One Million Dollars (\$1,000,000) per occurrence coverage for both bodily injury and property damage.
 - F. Professional Liability Insurance with limits of liability of not less than Five Million Dollars (\$5,000,000) each claim/annual aggregate.

9. Additional Terms

- 9.1 Entire Agreement. This Agreement, including all applicable Statement(s) of Work, reflects the entire agreement of the Parties with respect to its subject matter. Any other documents and communications preceding or contemporaneous with execution of this Agreement (including any proposals and other preliminary documents) are hereby superseded and shall have no binding effect except to the extent the terms of such documents and communications are expressly designated by SWCA and Client in writing as constituting part of this Agreement. SWCA shall have no obligations under the terms of any other contracts (e.g., contracts between Client and a third-Party who has engaged the services of Client where Client is engaging the services of SWCA as a subcontractor/subconsultant), except to the extent SWCA has been provided a copy of those contract terms and SWCA has expressly agreed in writing to be bound by those terms, in which event only those terms that are applicable to the Services to be performed by SWCA shall apply.
- 9.2 Amendment; Waiver; Severability. No amendment to this Agreement or any waiver may be enforced against a Party unless the amendment or waiver is agreed to in writing by that Party. If a provision of this Agreement is held to be invalid or unenforceable, the remainder of this Agreement shall continue in effect, and the provision held to be invalid or unenforceable shall be automatically amended to most closely approximate the original provision on terms that are valid and enforceable.
- 9.3 Assignment. The rights and obligations of the Parties under this Agreement may not be assigned or otherwise transferred without the written consent of the other Party, which consent shall not be unreasonably withheld. In the event Client does not pay any amounts payable to SWCA when due, SWCA may assign its payment rights and related rights under this Agreement to a collection agency or other third-Party.

- 9.4 **Interpretation.** The terms of this Agreement constitute the written expression of the mutual agreement of the Parties and shall be construed neutrally and not for or against either Party. Periods of time established by this Agreement in days shall be calculated using calendar days and not business days unless otherwise specified. When used in this Agreement, the term "include" or "including" and similar terms shall be construed to mean "including but not limited to".
- 9.5 **Governing Law.** This Agreement and any claims arising out of, or relating to the subject matter of, this Agreement shall be governed by the laws of the state or territory in which the project is located, without regard to choice of law rules, or such laws as are otherwise identified as governing by mutual written agreement of the Parties.
- 9.6 **Notices.** Notices and communications relating to the subject matter of this Agreement may be given and made by any reasonable means not inconsistent with this Agreement, including facsimile or email if reasonable in the circumstances.
- 9.7 **Relationship.** The relationship between Client and SWCA shall be that of independent contractors and not that of partners, joint venturers or otherwise.
- 9.8 **Execution.** This Agreement may be executed in counterparts and delivered by any reasonable means including electronically. An executed Agreement delivered electronically shall be deemed an original for all purposes, but the Parties shall provide a duly executed original promptly upon request from the other Party. This Agreement and any related SOWs may be executed electronically, including via DocuSign.

EXHIBIT A – STATEMENT OF WORK



Amherst Office
15 Research Drive
Amherst, Massachusetts 01002
Tel 413.256.0202 Fax 413.256.1092

February 12, 2024

David Morgan
Town of Arlington
730 Massachusetts Avenue
Arlington, MA 02474
Via email: dmorgan@town.arlington.ma.us

Re: 2024 Spy Pond Management and Monitoring Cost Proposal

David:

SWCA Environmental Consultants (SWCA) is pleased to present a cost proposal, in partnership with Water and Wetlands, to assist the Town of Arlington with in-lake management, monitoring, and reporting services at Spy Pond in Arlington, Massachusetts in the 2024 growing season. SWCA understands that this project is a collaboration between the Town of Arlington Water Bodies Working Group, the Arlington Conservation Commission, and the Spy Pond Committee.

SWCA appreciates the opportunity to provide you with these environmental services. If you have any questions regarding this cost proposal, please reach out by email at nvalentine@swca.com and by phone at 413.658.2012.

Sincerely,

A handwritten signature in black ink that reads "Naomi Valentine". The signature is fluid and cursive, with "Naomi" on top and "Valentine" below it.

Naomi Valentine
Senior Ecological Restoration Team Lead

PROJECT UNDERSTANDING

Vegetation management has been ongoing within Spy Pond for the 14 years. The 103-acre kettle hole pond has been populated by aquatic invasive plant species such as European naiad, curly-leaf pondweed, and snail-seed pondweed throughout its 45-acre littoral zone in recent years. The nuisance and invasive plants as well as filamentous algae and cyanobacteria are anticipated to require treatment with algaecide during the 2024 management season.

SWCA completed surveys within Spy Pond in the spring and late summer in 2022 and 2023. As detailed in the reports associated with this survey, SWCA has not observed much submerged vegetation within the majority of the pond. SWCA and Water and Wetland surveyed and treated Spy Pond May 19, 2023. About 40 acres of curly-leaf pondweed was treated, along with scattered Eurasian watermilfoil near Kelwyn Manor. On October 12, 2023, SWCA performed a plant survey and identified a population of brittle naiad.

SWCA understands that the Arlington Water Bodies Working Group, the Arlington Conservation Commission, and the Spy Pond Committee (the Project Stakeholders) hope to implement a selective submerged vegetation treatment plan to reduce and hopefully eliminate invasive plants, while limiting impact to desirable native vegetation in Spy Pond. This is a particular area of focus, because not many native plants remain within the waterbody following historic management and invasive infestations.

Additionally, SWCA will complete the required follow-up survey of the Engelmann's Flatsedge, per the response letter from NHESP, dated May 9, 2023 (NHESP Tracking No. 08-24360). Continued management within Spy Pond will be subject to approval by NHESP based on the requirements of this letter.

Spy Pond often contains a population of algae, which can grow to dangerous concentrations if not properly managed. Therefore, SWCA will also provide consultation and management of algae using algaecide. All active management and pesticide (herbicide and algaecide) management will be performed by Water and Wetlands and monitoring, reporting, and permit compliance will be performed by SWCA. This management program aims to improve the natural, economic, and cultural values of Spy Pond.

SCOPE OF SERVICES

TASK 1: ENGELMANN'S FLATSEDGE SURVEY AND REPORT

SWCA will conduct the Engelmann's flatsedge (*Cyperus engelmannii*) survey, as required by NHESP, using the protocol submitted and approved by NHESP during the initial survey in 2022. This protocol will be performed by Steve Johnson (previously approved) and a support botanist over two field days. The approved protocol includes the following.

- Search the habitat for Engelmann's flatsedge along the edges of Spy Pond
 - Wet exposed pond shores with muddy, sandy, or pebbly substrate
 - Approximately 4.0 kilometers of this shoreline on Spy Pond (including island)
- Identify Engelmann's flatsedge by known distinguishing features, understanding those of the similar species (*C. odoratus* and *C. strigosus*)
- Record the extent of all populations identified, single points for individuals, overall height and general growth habitat
- Record horizontal and vertical distance between lowest/highest plants and current water level

- Record the water levels at the existing gauge during both days of the survey
- Report all findings to NHESP via the Heritage Hub reporting system

TASK 2: PRE-TREATMENT AQUATIC SURVEY AND MANAGEMENT PLAN

SWCA's qualified biologist and lake and pond management specialists will review all project-specific information, including previous management, surveys, and the tasks mandated by the Natural Heritage & Endangered Species Program (NHESP). Following the review of all project documents, SWCA will conduct the following scope of services.

- Conduct one pre-treatment aquatic survey
 - Identify and GPS submerged or floating aquatic vegetative beds when observed
 - Does not include a full point-intercept survey of the pond (as performed in previous years)
 - Rake tosses will be used to confirm species composition and density when noted, but the entire littoral zone will not be searched via rake toss.
 - Special attention will be given to areas in which submerged aquatic vegetation has been previously noted
 - The survey will be performed by two people during 1 field day.
- Develop a management plan for the 2024 season including the following details (as needed)
 - Detail how the plan will be implemented in compliance with Engelmann's flatsedge impact avoidance requirements.
 - Water and Wetland will provide a balanced plan to manage all target vegetation that will be selective to desirable vegetation.
 - Set triggers for treatment (e.g., number of plants, height, extent)
 - Establish goals for treatment (e.g., reduction in extent and number, timing, reduction of inputs)
 - Provide dates for treatments.

ASSUMPTIONS

SWCA assumes the following to be true to accurately budget the services associated with this task.

- SWCA will be provided details on where vegetation has been noted in the existing surveys conducted by the Spy Pond Committee.
- This task does not include any permitting tasks or meetings.
- SWCA will require a change order if additional time is required for the pre-treatment survey.
- The management plan has been budgeted to include up to one round of revisions.

TASK 3: IN-LAKE VEGETATION AND AS-NEEDED ALGAE TREATMENT

The in-lake treatment portion of this project will be performed by Water and Wetlands with support from SWCA. Water and Wetlands will conduct the following scope of services associated with the lake management portion of Task 2. Also under this Task, SWCA will assist in permit maintenance and communications required to implement the pond management program within the approved wetland and rare species permits.

- Submit an application for a License to Apply with MassDEP prior to any pesticide application.

- Conduct one initial herbicide application within Spy Pond to target curly-leaf pondweed in May.
 - Manage all populations of target vegetation as detailed in the OOC and in communication with WBWG.
 - Curly-leaf pondweed with 0.5 to 0.75 gallons/surface acre of diquat in April
- Conduct as-needed algaecide application (up to one treatment)
 - Water and Wetlands will use of CaptainXTR, which was requested to reduce costs.
 - Applied directly to problematic algal mats or as directed by algae sampling.
- Submit a memo to the Town within 1 week of each treatment including the following.
 - Map of observations of invasive plants and excess vegetation growth within treatment areas and an outline of the treatment area for the visit in question
 - Summary of herbicide(s) used, amount applied, area treated, target vegetation, and relative concentrations per area in a daily use report.
 - Any other observations.

ASSUMPTIONS

In preparing the scope and cost estimate for this Task, SWCA assumes the following:

- Any additional treatments, other than those described above, will require a change order.
- SWCA will work closely with the Arlington Water Bodies Group to schedule all treatment visits.
 - SWCA assumes the Project Stakeholders will monitor Spy Pond for excessive growth.
 - SWCA will respond to any treatment requests within a week of the request (weather-permitting).
 - Should any treatment visits be cancelled within, or less than 24 hours of a treatment, Water and Wetlands may need to charge a cancellation fee.
- SWCA will have one point of contact for algaecide or herbicide application planning.
 - David Morgan was the point of contact in 2023 and should remain as such unless unavailable.
- The following number of applications have been assumed and budgeted for. However, SWCA will only invoice the Town based on the actual treatment events that have taken place during the 2024 season.
 - One total curly-leaf pondweed diquat application
 - One CaptainXTR algaecide application
- This Task does not include the cost to collect or analyze any water quality or algae samples.

TASK 4: POST-TREATMENT SURVEY AND REPORT

SWCA will conduct a post-treatment survey at least 3 weeks following the last treatment event in Spy Pond. The survey will be conducted just as detailed for the pre-treatment survey. SWCA then will produce an annual report to the Project Stakeholders that includes the locations and densities of all vegetative beds within Spy Pond as well as all treatment activities that occurred within Spy Pond in 2024. This report will be submitted to the Arlington Conservation Agent by December 15, 2024.

- General abundance of desirable, native vegetation
- Notes on all treatment activities.

- Notes on any algae sampling conducted (if applicable)
- Suggestions for the 2025 management program
- Site photographs and survey maps

ASSUMPTIONS

In preparing the scope and cost estimate for this Task, SWCA assumes the following:

- The post-treatment survey will be conducted by two SWCA surveyors during one field day.
- All assumptions from Task 2 apply to this task.

SCHEDULE

SWCA will work closely with the Town and all stakeholders to meet all project deadlines and benchmarks. The schedule provided in Table 1 is SWCA's rough estimate of when each task will take place based on vegetation development and coordination with active treatment efforts.

Table 1. SWCA's Estimated Timeline

TASK	ESTIMATED TIMELINE
Task 1: Engelmann's Flatsedge Survey and Report	1 Field Day; August – Early October
Task 2: Pre-Treatment Aquatic Survey and Management Plan	1 Field Day; April – June 2024
Task 3: In-Lake Vegetation and As-Needed Algae Management	1-2 Field Days; May 2024
Task 4: Post-Treatment Survey and Summary Report	1 Field Day; by September 15, 2024

COST

SWCA will submit invoices monthly for all work performed in the previous month. This project has been estimated as a time and materials (T&M) budget with not-to-exceed (NTE) costs listed in the "Estimated Cost" section of Table 2. Payment is due within 30 days of each issued invoice. This proposal is valid for 90 days after submission.

Table 2. SWCA's Estimated Cost

TASK	TOTAL NTE COST
Task 1: Engelmann's Flatsedge Survey and Report	\$9,905
Task 2: Pre-Treatment Aquatic Survey and Management Plan	\$8,370
Task 3: In-Lake Vegetation and As-Needed Algae Treatment	\$13,595
Task 4: Post-Treatment Survey and Summary Report	\$9,635
Total Cost:	\$41,505

EXHIBIT B – RATE SCHEDULE

2024 LABOR CATEGORIES AND BILLING RATES

Environmental Consulting Services

Cultural Resources		Graphics/Media Production	
Environmental Resources		GIS/CADD Resources	
Paleontology		Technical Writing/Editing	
Scientific Resources		Training/Facilitating	
Planning Resources		Air Quality	
Specialist I.....	\$77.00	Specialist IX.....	\$169.00
Specialist II.....	\$91.00	Specialist X	\$189.00
Specialist III.....	\$104.00	Specialist XI	\$207.00
Specialist IV.....	\$114.00	Specialist XII	\$226.00
Specialist V.....	\$123.00	Subject Matter Expert I	\$230.00
Specialist VI.....	\$137.00	Subject Matter Expert II.....	\$242.00
Specialist VII.....	\$147.00	Subject Matter Expert III	\$268.00
Specialist VIII	\$158.00	Subject Matter Expert IV	\$293.00

Engineering and Special Services (Tier 1)

Specialist IV.....	\$123.00	Specialist X	\$207.00
Specialist V.....	\$137.00	Specialist XI.....	\$226.00
Specialist VI	\$147.00	Specialist XII	\$242.00
Specialist VII.....	\$158.00	Subject Matter Expert I	\$242.00
Specialist VIII.....	\$169.00	Subject Matter Expert II.....	\$252.00
Specialist IX	\$189.00	Subject Matter Expert III.....	\$278.00
		Subject Matter Expert IV.....	\$305.00

Direct expenses are subject to a 15% administrative markup and subcontractor expenses are subject to a 20% administrative markup. These rates do not apply to depositions or testimonies at administrative hearings and trials. Such activities fall under our Expert Witness rates, which vary by state.

A communication/data fee is invoiced at a rate of 3% of labor to cover such expenses (i.e.: cell phones, data plans, faxes, etc.).

Overtime is invoiced at 1.2 times standard rates. All overtime must be approved in writing by client. Client shall pay overtime for all hours worked in excess of forty hours per week. Client shall not pay overtime rates for Contractor's salaried employees.

Per Diem is billed at the GSA rate in place at the time of billing. Mileage is billed at the IRS mileage rate in place at the time of billing.



Town of Arlington, Massachusetts

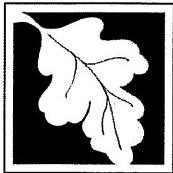
Ratify Enforcement Order Amendment: 66-66R Dudley Road.

Summary:

Ratify Enforcement Order Amendment: 66-66R Dudley Road.

ATTACHMENTS:

Type	File Name	Description
<input type="checkbox"/> Reference Material	66-66R_Dudley_Enforcement_Order_11132023.pdf	66-66R Dudley Enforcement Order 11132023
<input type="checkbox"/> Reference Material	66R_Dudley_Street_Enforcement_Order_02152024.pdf	66R Dudley Street Enforcement Order 02152024



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number: _____

Important:
When filling out
forms on the
computer, use
only the tab
key to move
your cursor -
do not use the
return key.



A. Violation Information

This Enforcement Order is issued by:

Arlington _____ 11/13/2023
Conservation Commission (Issuing Authority) _____ Date

To:

Robert Castelluccio and Salvatore Lorusso, S & R Realty Trust _____

Name of Violator

66-66R Dudley Street _____

Address

1. Location of Violation:

Property Owner (if different)

66-66R Dudley Street _____

Street Address

Arlington _____

02476

City/Town

Zip Code

55-2 _____

30A

Assessors Map/Plat Number

Parcel/Lot Number

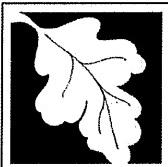
2. Extent and Type of Activity (if more space is required, please attach a separate sheet):

Unpermitted patio removal and re-installation

B. Findings

The Issuing Authority has determined that the activity described above is in a resource area and/or buffer zone and is in violation of the Wetlands Protection Act (M.G.L. c. 131, § 40) and its Regulations (310 CMR 10.00), because:

- the activity has been/is being conducted in an area subject to protection under c. 131, § 40 or the buffer zone without approval from the issuing authority (i.e., a valid Order of Conditions or Negative Determination).



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number:

B. Findings (cont.)

- the activity has been/is being conducted in an area subject to protection under c. 131, § 40 or the buffer zone in violation of an issuing authority approval (i.e., valid Order of Conditions or Negative Determination of Applicability) issued to:

Name _____

Dated _____

File Number _____

Condition number(s) _____

- The Order of Conditions expired on (date): _____ Date _____

- The activity violates provisions of the Certificate of Compliance.

- The activity is outside the areas subject to protection under MGL c.131 s.40 and the buffer zone, but has altered an area subject to MGL c.131 s.40.

- Other (specify):

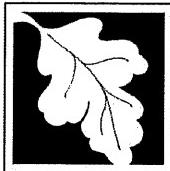
C. Order

The issuing authority hereby orders the following (check all that apply):

- The property owner, his agents, permittees, and all others shall immediately cease and desist from any activity affecting the Buffer Zone and/or resource areas.
 Resource area alterations resulting from said activity shall be corrected and the resource areas returned to their original condition.
 A restoration plan shall be filed with the issuing authority on or before _____ Date _____

for the following:

The restoration shall be completed in accordance with the conditions and timetable established by the issuing authority.



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

DEP File Number: _____

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

C. Order (cont.)

- Complete the attached Notice of Intent (NOI). The NOI shall be filed with the Issuing Authority on or before:

Date _____

for the following:

No further work shall be performed until a public hearing has been held and an Order of Conditions has been issued to regulate said work.

- The property owner shall take the following action (e.g., erosion/sedimentation controls) to prevent further violations of the Act:

Install a 12" mulch sock for erosion control at the low point of the site inside of the fence on the bank of Mill Brook. Ensure the sock is maintained and in good condition through April 2024. Contact the Mill Brook Condo Association to discuss conducting work on the Association's property by February 15, 2024. Send confirmation of the correspondence to concomm@town.arlington.ma.us and include details of proposed next steps. Property owner shall at a minimum conduct the restoration work as proposed in spring of 2024. Property owner shall attend the March 7, 2024 meeting of the Conservation Commission for further discussion.

Failure to comply with this Order may constitute grounds for additional legal action. Massachusetts General Laws Chapter 131, Section 40 provides: "Whoever violates any provision of this section (a) shall be punished by a fine of not more than twenty-five thousand dollars or by imprisonment for not more than two years, or both, such fine and imprisonment; or (b) shall be subject to a civil penalty not to exceed twenty-five thousand dollars for each violation". Each day or portion thereof of continuing violation shall constitute a separate offense.

D. Appeals/Signatures

An Enforcement Order issued by a Conservation Commission cannot be appealed to the Department of Environmental Protection, but may be filed in Superior Court.

Questions regarding this Enforcement Order should be directed to:

Name _____

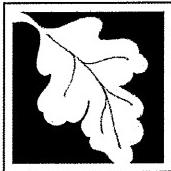
Phone Number _____

Hours/Days Available _____

Issued by:

Conservation Commission _____

Conservation Commission signatures required on following page.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 9 – Enforcement Order
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number:

D. Appeals/Signatures (cont.)

In a situation regarding immediate action, an Enforcement Order may be signed by a single member or agent of the Commission and ratified by majority of the members at the next scheduled meeting of the Commission.

Signatures:

[Handwritten signature]

Printed Name

Signature

Signature

Printed Name

Signature

Printed Name

9584 010 5270 0648 722 51

Signature of delivery person or certified mail number



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

DEP File Number: _____

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Violation Information

Important:

When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



This Enforcement Order is issued by:

Arlington

Conservation Commission (Issuing Authority)

2/15/2024

Date

To:

Robert Castelluccio and Salvatore Lorusso, S & R Realty Trust

Name of Violator

66-66R Dudley Street

Address

1. Location of Violation:

Property Owner (if different)

66-66R Dudley Street

Street Address

Arlington

City/Town

55-2

Assessors Map/Plat Number

02476

Zip Code

30A

Parcel/Lot Number

2. Extent and Type of Activity (if more space is required, please attach a separate sheet):

Unpermitted patio removal and re-installation

B. Findings

The Issuing Authority has determined that the activity described above is in a resource area and/or buffer zone and is in violation of the Wetlands Protection Act (M.G.L. c. 131, § 40) and its Regulations (310 CMR 10.00), because:

- the activity has been/is being conducted in an area subject to protection under c. 131, § 40 or the buffer zone without approval from the issuing authority (i.e., a valid Order of Conditions or Negative Determination).



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

DEP File Number: _____

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Findings (cont.)

- the activity has been/is being conducted in an area subject to protection under c. 131, § 40 or the buffer zone in violation of an issuing authority approval (i.e., valid Order of Conditions or Negative Determination of Applicability) issued to:

Name _____

Dated _____

File Number _____

Condition number(s) _____

- The Order of Conditions expired on (date): _____ Date _____
- The activity violates provisions of the Certificate of Compliance.
- The activity is outside the areas subject to protection under MGL c.131 s.40 and the buffer zone, but has altered an area subject to MGL c.131 s.40.
- Other (specify):

C. Order

The issuing authority hereby orders the following (check all that apply):

- The property owner, his agents, permittees, and all others shall immediately cease and desist from any activity affecting the Buffer Zone and/or resource areas.
- Resource area alterations resulting from said activity shall be corrected and the resource areas returned to their original condition.
- A restoration plan shall be filed with the issuing authority on or before _____ Date _____

for the following:

The restoration shall be completed in accordance with the conditions and timetable established by the issuing authority.



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number: _____

C. Order (cont.)

- Complete the attached Notice of Intent (NOI). The NOI shall be filed with the Issuing Authority on or before:

Date _____

for the following:

No further work shall be performed until a public hearing has been held and an Order of Conditions has been issued to regulate said work.

- The property owner shall take the following action (e.g., erosion/sedimentation controls) to prevent further violations of the Act:

Install a 12" mulch sock for erosion control at the low point of the site inside of the fence on the bank of Mill Brook. Ensure the sock is maintained and in good condition through April 2024. Contact the Mill Brook Condo Association to discuss conducting work on the Association's property and send confirmation of the correspondence to concomm@town.arlington.ma.us and include details of proposed next steps. Property owner shall at a minimum conduct the restoration work as proposed in spring of 2024. Property owner shall attend the March 7, 2024 meeting of the Conservation Commission for further discussion and to report on communications with Mill Brook Condo Association.

Failure to comply with this Order may constitute grounds for additional legal action. Massachusetts General Laws Chapter 131, Section 40 provides: "Whoever violates any provision of this section (a) shall be punished by a fine of not more than twenty-five thousand dollars or by imprisonment for not more than two years, or both, such fine and imprisonment; or (b) shall be subject to a civil penalty not to exceed twenty-five thousand dollars for each violation". Each day or portion thereof of continuing violation shall constitute a separate offense.

D. Appeals/Signatures

An Enforcement Order issued by a Conservation Commission cannot be appealed to the Department of Environmental Protection, but may be filed in Superior Court.

Questions regarding this Enforcement Order should be directed to:

Name _____

Phone Number _____

Hours/Days Available _____

Issued by:

Conservation Commission _____

Conservation Commission signatures required on following page.



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number: _____

D. Appeals/Signatures (cont.)

In a situation regarding immediate action, an Enforcement Order may be signed by a single member or agent of the Commission and ratified by majority of the members at the next scheduled meeting of the Commission.

Signatures:

Signature	Printed Name

Signature of delivery person or certified mail number



Town of Arlington, Massachusetts

DEP #091-0326: Request for Permit Amendment: Arlington DPW Culvert Repair Project

Summary:

DEP #091-0326: Request for Permit Amendment: Arlington DPW Culvert Repair Project.

ATTACHMENTS:

Type	File Name	Description
Reference Material	Arlington_DPW_Facility_Culvert_Repair_Amendment_Request_2.7.24_-reduced.pdf	Arlington DPW Facility Culvert Repair Amendment Request 2.7.24



westonandsampson.com

55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

Notice of Intent- Amendment Request

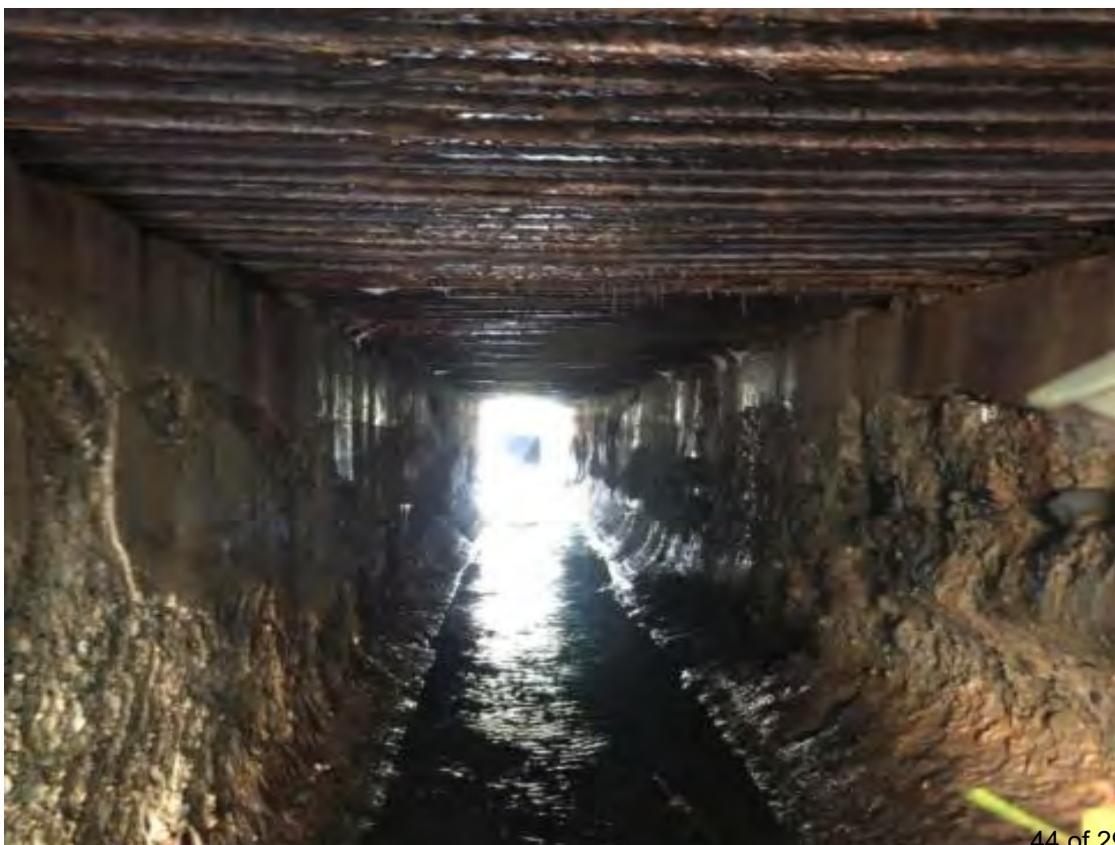


February 2024

DPW FACILITY CULVERT REPAIR AMENDMENT TO DEP # 091-0326

PREPARED FOR:
TOWN OF ARLINGTON DPW

SUBMITTED TO:
ARLINGTON CONSERVATION COMMISSION



February 7, 2024

Arlington Conservation Commission
730 Mass Ave. Annex
Arlington, MA 02476

Re: Request for Amended Order of Conditions
DPW Facility
51 Grove Street
Arlington MA
DEP# 091-0326

Dear Members of the Commission:

On behalf of the Arlington Department of Public Works (DPW), we are pleased to submit the attached request for Amended Order of Conditions for the DPW Facility project (DEP #091-0326) for your review.

A Notice of Intent for the DPW Facility project was filed with the Arlington Conservation Commission on October 27, 2020. The Conservation Commission issued an Order of Conditions (DEP File No. 091-0326) on December 23, 2020 (see attached Order of Conditions) approving the work. In December of 2023, an extension of the Order of Conditions was requested since construction of the previously approved DPW site renovations had not been completed. The extension has been granted through December 23, 2027. Since the issuance of the Order of Conditions, a portion of the project has been modified; therefore, we are submitting this request for Amended Order of Conditions. A description of the original project, followed by a description of the proposed project changes, is provided below.

Original Project

The Town of Arlington DPW previously proposed and are in the process of commencing a project to renovate the DPW facility to support Town operations. The previously existing buildings were outdated, undersized, and contained many code deficiencies and inefficiencies to properly support operations. The previously approved Project involves:

1. The renovation of four buildings and the construction of one new building, plus the replacement of operations support features such as the fuel island and the salt shed.
 - a. The new nearly 30,000 square foot building which includes interior vehicle storage, office space, maintenance bays, vehicle washing, and other operational support features.
2. Two of the previously existing salt shed buildings were demolished. A new salt shed has been constructed to replace two demolished salt shed buildings. The new salt shed allows for delivery vehicles to dump salt directly in the building; thereby minimizing cleanup and remnants exterior to the building.
3. Work within the riverfront area and the 100-foot wetland buffer zone include site improvements and minor grade changes. A portion of the new building also lies within these areas. There will be a reduction in impervious surfaces within these areas due to installation of additional landscaped islands.

4. The stormwater design report was included as Appendix C in the October 2020 Notice of Intent. Site stormwater improvements include:
 - a. Catch basins were replaced with deep sump hooded catch basins.
 - b. Installation of three (3) Hydrodynamic separators.
 - c. Construction of an underground chamber detention system to control peak flows.
5. In addition to the improved stormwater features, the Project included the following additional features to improve the overall integrity of stormwater and the environment:
 - a. Improved storage of vehicles, equipment and materials (maximize indoor vs. outdoor).
 - b. Improved storage and handling of liquid petroleum products.
 - c. Improved vehicle washing operations (no discharge to stormwater system).
6. Native plantings within landscape areas.

Proposed Project Changes

The only proposed alteration to the previously approved DPW Facility submission is the repair of a portion of the existing culvert that the Mill Brook is currently flowing through at the site (approximately 204 LF) using a glass reinforced plastic (GRP) liner. Currently Mill Brook travels through a culvert under Building B at the Arlington DPW and surrounding parking areas (see Appendix F for plan sheet displaying limit of culvert liner). A culvert inspection was performed on October 22nd, 2020, by Weston & Sampson Engineers. The assessment led to the conclusion that the entire existing culvert is in poor to fair condition. Portions of the culvert have reached their intended service life and need rehabilitation. The report specifically outlined a portion of the culvert in the southern portion of the site, where the culvert exits the existing DPW building B and ends at the Arlington High school property, which is in urgent need of repair or replacement. The deterioration in that section of the culvert is significant and the concrete has lost its structural capacity. Given the state of the culvert and its proximity to adjacent structures, parking areas, and critical utilities, this is a structurally important culvert and must be maintained in good condition. The DPW is proposing to rehabilitate this section of the culvert with a structural liner system, which will minimize impacts to adjacent resource areas.

The DPW proposes to utilize a GRP structural liner system which can provide up to a 100-year life expectancy to the rehabilitated culvert (see Appendix B for additional GRP Structural Lining Systems details). The GRP liner segments will be custom made to fit the size and shape of existing culvert. Since the liner will significantly improve surface roughness of the culvert, the flow carrying characteristics of the rehabilitated culvert will improve despite the decrease in hydraulic opening.

Culvert Liner Installation

The proposed liner will be installed via the existing section of the culvert that daylights in the center of the site. The liner segments will be lowered into the culvert and will be transported along the length of the culvert to the required location. Each liner segment will connect to the previously installed segments by means of socket and spigot joint. Once the liner is in place, the gap between the liner and the existing culvert wall will be filled with a free-flowing high-strength grout. Please see Appendix E for display of the order of the culvert liner installation.

On January 31, 2024, the project team met with representatives from the Arlington Conservation Commission to discuss this project and a few questions/comments were brought up on the installation of the proposed culvert liner. Responses to these comments are included below.

Comment 1: How do you plan to install the liner?

a. From which end of the culvert will the liner be installed?

W&S Response: Please refer to the plan sheets found in Appendix E for reference of regions of the culvert proposed for repair. The liner pieces will be dropped into the existing culvert from Region F, which is currently the open trash rack area. Next, the dropped pieces will be pulled from Region F upstream to Region D, which denotes the inlet of the liner pipe. They will start at Region D (near building B) and work their way downstream to Region F (daylighted portion of culvert). Once Region D, E, and F are installed, the liner will continue to be installed beginning with the installation downstream at the end of Region G and work upstream to the ending point at Region F. When working from Region G upstream to Region F, the pieces will be dropped in at the opening of the existing precast culvert.

b. How is the liner secured in place?

W&S Response: The pieces of the culvert liner will be dropped into the existing culvert and rolled into place on a rail system. They will then be pushed upstream and winched together. Once the liner pieces are winched together, they will be blocked solid in place. The blocks will be wood blocking used as wedges to hold the liner tight to the ceiling and existing culvert walls. See Photo 1 below that shows how the liner pipe is secured until the low-density cellular concrete is pumped into the annular space.



Photo 1: Liner Blocking Example

c. When is the liner system grouted?

W&S Response: Once all liner pieces are installed from inlet to outlet, bulkheads are built, joints are sealed, and the grout ports are drilled to the low-density cellular concrete will be pumped into the annular space.

Comment 2: How do you plan to stage the work, duration of liner installation and follow up steps?

W&S Response: The liner pipe will be shipped as a complete order from Maine. Due to space limitation on site, two containers will be shipped to site at a time. The liner pipe will be stored in the container until it is ready to be lowered into the existing culvert. The anticipated duration of this work is three weeks for installation of the liner pipe, bulkhead construction, and joint seals. There will then be a week for pumping the low-density cellular concrete into the annular space.

Comment 3: How do you plan to control the water in the culvert while the work is performed?

W&S Response: A water bypass will be set up from the inlet to the outlet of the liner pipe. A Godwin Road ramp will be set up over the roadway from upper site to lower site to allow vehicles to drive over the bypass in place. See photo 2 below, in red this is displaying how the bypass will take place.

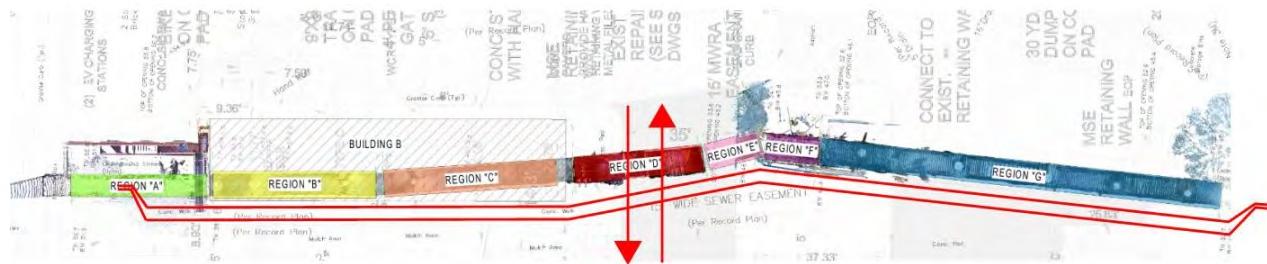


Photo 2: Glodwing Road Ramp Placement

It is intended to pump the water from section A (photo 2) and bring water on the surface all the way to the high school side, beyond region G of the culvert.

Ramps as shown in photo 3 below, will be used where needed to drive from lower to upper site.



Photo 3: Example of Ramps to be Utilized

Comment 4: What is the glue/sealant for the proposed liner installation consist of?

W&S Response: Sikaflex-1A will be utilized for the culvert installation. Please see Appendix A for the Sikaflex-1A data sheet.

Comment 5: How will the gasket between each of the liner segments be installed?

W&S Response: Please see Appendix D for details on how the gasket will be installed utilizing a Tylox gasket adhesive/glue. Please note, there is no data sheet available on the Tylox gasket adhesive/glue per communications with individuals who install this type of liner.

Environmental Considerations

The proposed project will include the installation of approximately 204 LF GRP liner which will result in minor additional impacts to resource areas protected under the Massachusetts Wetlands Protection Act (WPA) including bank, land under water, and bordering land subject to flooding. Prior to the start of the construction of the current OOC for the DPW site renovations project, the riverfront area associated with Mill Brook was mostly impervious. In the previous NOI submission, the site design included the addition of landscaped areas adjacent to the culvert, converting some of the riverfront area from impervious to pervious; however, since construction is still ongoing, this effort has not been completed to date. During the installation of culvert lining, no additional alterations will be made within the riverfront area.

The Town of Arlington Wetland Bylaws places additional protection zones (i.e., buffer zones) off of the bank (Mill Brook) identified onsite. These buffer zones include a 25-ft, 50-ft, and 100-ft from the resource area (Top of Bank of Mill Creek). No additional impacts will fall within these buffer zones than previously proposed and permitted.

Compliance with Arlington Wetland Regulations

Per the Arlington Wetland Regulations Section 18 (A) Project Changes and Permit Amendments it states:

In the event a permittee seeks to make any change to a permitted project or other Commission determination, the Applicant shall consult with the Conservation Agent, who may approve the change or require review by the full Commission. Any such requested modification shall have the same or less impact on the resource area values protected by the Bylaw as the approved work. If the Conservation Agent decides that the requested change is significant enough to warrant Commission review, then the following procedures shall be followed. No amended permit shall be issued for a permit that has expired.

We are submitting this document to request input from the Conservation Agent and Conservation Commission if the proposed alterations to the existing culvert can be filed as an amendment to the existing Order of Conditions (DEP File No. 091-0326). A discussion of compliance with the standards listed in Section 18(B)(2) is provided for your review below.

The Conservation Commission first shall determine whether the requested change warrants the filing of a new Notice of Intent or whether it is sufficiently minor to be considered as an amendment to the

original Final Order of Conditions. The Conservation Commission may in its sole and unreviewable discretion determine the project is minor only if:

- a. The purpose of the project has not changed.

W&S Response: The previously approved project purpose was to improve the conditions of the existing DPW facility. Through the culvert repairs (i.e., culvert liner installation) this will lead to the improvement of flow of the Mill Brook through the culvert and add up to a 100-year life expectancy to the rehabilitated culvert.

- b. The scope of the project has not increased.

W&S Response: The existing culvert spans across the center of the previously proposed limit of work. All previously permitted alterations within jurisdictional areas are associated with the Mill Brook. The new work proposed only includes the installation of the culvert liner that will require no additional demolition. Installation will be performed by lowering the liner segments into the culvert through existing daylight sections, manually moving the segments to their final locations, and connecting the segments to create a continuous lined culvert. Overall, through the culvert repair this will lead to additional improvements to the DPW facility as proposed in the original NOI submission.

- c. The project still meets relevant standards in these regulations.

W&S Response: The previously proposed project and culvert installation efforts will still meet relevant standards determined in the Arlington Regulations as approved in the previous order of conditions.

- d. Resource areas are still protected.

W&S Response: The previously approved project has commenced and all required erosion and sediment controls have been implemented. Throughout the remaining work, all required erosion and sediment controls will be monitored and maintained to protect resource areas.

- e. The potential for adverse impacts to resource area values will not be increased.

W&S Response: Through the installation of the culvert liner, it is projected to improve the carrying capacity for this portion of the culvert, leading to overall improvements from existing conditions. Therefore, no adverse impacts to bank, land under water, or bordering land subject to flooding are anticipated.

As part of this submission, we have attached the following supporting information:

- Appendix A: Data Sheets
- Appendix B: Culvert Liner Details
- Appendix C: Order of Conditions
- Appendix E: Culvert Sequence of Work Sheets
- Appendix F: Updated Plan Sheet

If you have any questions regarding this submittal, please contact me at (978) 532-1900.

Very truly yours,

WESTON & SAMPSON ENGINEERS, INC.



Hailey Page
Environmental Scientist

APPENDIX A

PRODUCT DATA SHEET

Sikaflex®-1A

ELASTOMERIC JOINT SEALANT / ADHESIVE

PRODUCT DESCRIPTION

Sikaflex®-1A is a premium-grade, high-performance, moisture-cured, 1-component, polyurethane-based, non-sag elastomeric sealant. Sikaflex-1a can be used in green and damp concrete applications. Meets Federal Specification TT-S-00230C, Type II, Class A. Meets ASTM C920, Type S, Grade NS, Class 35, Use T, NT, O, M, A, I. Canadian standard CAN/CGSB 19.13-M87.

USES

- Designed for all types of joints where maximum depth of sealant will not exceed 1/2 in.
- Excellent for small joints and fillets, windows, door frames, reglets, flashing, common roofing detail applications, and many construction adhesive applications.
- Suitable for vertical and horizontal joints; readily placeable at 40°F
- Has many applications as an elastic adhesive between materials with dissimilar coefficients of expansion.
- Submerged conditions, such as canal and reservoir joints.

CHARACTERISTICS / ADVANTAGES

- Eliminates time, effort, and equipment for mixing, filling cartridges, pre-heating or thawing, and cleaning of equipment.
- Fast tack-free and final cure times.
- High elasticity - cures to a tough, durable, flexible consistency with exceptional cut and tear -resistance.
- Stress relaxation.
- Excellent adhesion - bonds to most construction materials without a primer.
- Excellent resistance to aging, weathering.
- Proven in tough climates around the world.

- Can be applied to green concrete 24 hours after pour
- Can be applied to damp concrete 1 hour after getting wet
- Non-staining.
- Jet fuel resistant.
- Certified to NSF/ANSI/CAN 61 for potable water (meets applicable requirements of NSF/ANSI 600).
- Urethane-based; suggested by EPA as a caulk and crack sealant for radon reduction.
- Paintable with water-, oil- and rubber-based paints.
- Capable of ±35% joint movement.

APPROVALS / STANDARDS

- ASTM C920, Type S, Grade NS, Class 35, Use T, NT, O, M, A, I
- SWRI validated acc. to ASTM C719 (No. 0123-S0128)
- Federal specification TT-S-00230 C Type II, Class A
- Canadian Standard CAN/CGSB 19.13-M87
- Certified to NSF/ANSI/CAN 61 for potable water (meets applicable requirements of NSF/ANSI 600).



PRODUCT INFORMATION

Packaging	10.1 fl. oz. (300 ml) cartridge, 20 fl. oz. (600 ml) sausage, 4.5 gal (17 L) in a 5 gal pail, 52 gal (197 L) in a 55 gal drum		
Shelf Life	Cartridge and Sausage: 12 months in original, unopened packaging. Pail and Drum: 6 months in original, unopened packaging.		
Storage Conditions	Store at 40°-95°F (4°-35°C).		
Color	White, colonial white, aluminum gray, limestone, black, dark bronze, capitol tan, stone and medium bronze. Special architectural colors on request.		

TECHNICAL INFORMATION

Shore A Hardness	(21 day) 45±5			(ASTM C 661)
Tensile stress at specified elongation	21 day Tensile Stress		175 psi (1.21 MPa)	(ASTM D 412)
	Stress @ 100%		85 psi (0,59 N/mm ²)	
Elongation at Break	550 %			(ASTM D-412)
Movement Capability	±35 %			(ASTM C-719)
Adhesion in peel	Substrate	Peel Strength	Adhesion loss	(ASTM C-794) (TT-S-00230C)
	Concrete	20 lbs	0 %	
	Aluminium	20 lbs	0 %	
	Glass	20 lbs	0 %	
Tear Strength	55 lb./in.			(ASTM D-624)
Service Temperature	-40 °F to +170 °F			
Chemical Resistance	Good resistance to water, diluted acids, and diluted alkalines. Consult Technical Service for specific data.			
Resistance to Weathering	Excellent			

APPLICATION INFORMATION

Coverage	10.1 oz Cartridge: Yield in Linear Feet		
	Width/Depth	1/4"	3/8"
	1/4"	24.3	
	3/8"	16.2	10.8
	1/2"	12.1	8.1
	3/4"	8.1	5.4
	1"		3.0
	1.25"		2.4
	1.5"		2.0
	20 oz Sausage: Yield in Linear Feet		
	Width/Depth	1/4"	3/8"
	1/4"	48.1	
	3/8"	32.1	21.4
	1/2"	24.1	16.0
	3/4"	16.0	10.7
	1"		6.0
	1.25"		4.8
	1.5"		4.0

1 gallon: Yield in Linear Feet

Width/Depth	1/4"	3/8"	1/2"
1/4"	307.9		
3/8"	205.3	136.8	
1/2"	153.9	102.6	77.0
3/4"	102.6	68.4	51.3
1"			38.5
1.25"			30.8
1.5"			25.7

Cure Time	4 to 7 days (73 °F / 50 % r.h.)
Curing Rate	up to 1/8" after 24 hours (73 °F / 50 % r.h.)
Tack Free Time	3 to 6 hours (73 °F / 50 % r.h.)

BASIS OF PRODUCT DATA

Results may differ based upon statistical variations depending upon mixing methods and equipment, temperature, application methods, test methods, actual site conditions and curing conditions.

LIMITATIONS

- Allow 1 week cure at standard conditions when using Sikaflex-1a in total water immersion situations.
- When overcoating with water, oil and rubber based paints, compatibility and adhesion testing is essential.
- Sealant should be allowed to cure for 7 days prior to overcoating
- Avoid exposure to high levels of chlorine. (Maximum continuous level is 5 ppm of chlorine.)
- Maximum depth of sealant must not exceed 1/2 in.; minimum depth is 1/4 in.
- Maximum expansion and contraction should not exceed 35% of average joint width.
- Do not cure in the presence of curing silicone sealants.
- Avoid contact with alcohol and other solvent cleaners during cure.
- Do not apply when moisture-vapor-transmission condition exists from the substrate as this can cause bubbling within the sealant.
- Use opened units the same day.
- When applying sealant, avoid air-entrapment.
- Since system is moisture-cured, permit sufficient exposure to air.
- White color tends to yellow slightly when exposed to ultraviolet rays.
- Light colors can yellow if exposed to direct gas fired heating element.
- The ultimate performance of Sikaflex-1a depends on good joint design and proper application with joint surfaces properly prepared.
- The depth of sealant in horizontal joints subject to traffic is 1/2 in.
- Do not tool with detergent or soap solutions.
- Do not use in contact with bituminous/asphaltic materials.
- In green concrete applications sealing joints in poor or

low strength concrete 24 hours after pour may impact ability of sealant to gain proper adhesion.

- In damp concrete applications all standing water and excess water must be eliminated prior to the 60 minute waiting time.

ENVIRONMENTAL, HEALTH AND SAFETY

For further information and advice regarding transportation, handling, storage and disposal of chemical products, user should refer to the actual Safety Data Sheets containing physical, environmental, toxicological and other safety related data. User must read the current actual Safety Data Sheets before using any products. In case of an emergency, call CHEMTREC at 1-800-424-9300, International 703-527-3887.

APPLICATION INSTRUCTIONS**SUBSTRATE PREPARATION**

Product Conditioning: Condition material to 65°-75°F before using.

Clean all surfaces. Joint walls must be sound, clean, frost-free, and free of oil and grease. Curing compound residues and any other foreign matter must be thoroughly removed. A roughened surface will also enhance bond. Install bond breaker tape or backer rod to prevent bond at base of joint. Priming is not usually necessary. Most substrates only require priming if testing indicates a need or where sealant will be subjected to water immersion after cure.

For green concrete applications control joints must be cut 8 hours prior to sealant installation and in expansion joint forms must be removed 4 hours prior to sealant installation. For wet concrete applications all excess or standing water must be displaced and concrete must then dry for a minimum of 60 min prior to sealant installation. Consult Sikaflex Primer Technical Data Sheet or Technical Service for additional information on priming.

APPLICATION METHOD / TOOLS

Recommended application temperatures: 40°-100°F. For cold weather application, condition units at approximately 70°F; remove prior to using. For best performance, Sikaflex-1a should be gunned into joint when joint slot is at mid-point of its designed expansion and contraction. Place nozzle of gun into bottom of the joint and fill entire joint. Keep the nozzle in the sealant, continue on with a steady flow of sealant preceding the nozzle to avoid air entrapment. Avoid overlapping of sealant to eliminate entrapment of air.

Sikaflex-1a can be applied on green concrete after the concrete has cured for a minimum of 24 hours at 75°F. Control joints must be cut and open for min of 8 hours prior to application. Expansion joints must have forms removed a minimum of 4 hours prior to application. For damp concrete applications Sikaflex-1a can be applied 60 minutes after any and all water has been displaced.

Tooling & Finishing

Tool sealant to ensure full contact with joint walls and remove air entrapment. Joint dimension should allow for 1/4 inch minimum and 1/2 inch maximum thickness for sealant. Proper design is 2:1 width to depth ratio, For use in horizontal joints in traffic areas, the absolute minimum depth of the sealant is 1/2 in. and closed cell backer rod is recommended.

Removal

Use personal protective equipment (chemical resistant gloves/goggles/clothing). Without direct contact, remove spilled or excess product and placed in suitable sealed container. Dispose of excess product and container in accordance with applicable environmental regulations.

Over Painting

Allow 1-week cure at standard conditions when using Sikaflex-1a in total water immersion situations and prior to painting.

CLEANING OF TOOLS

Clean all tools and application equipment with Sika® Remover-208 immediately after use. Hardened material can only be removed mechanically.

OTHER RESTRICTIONS

See Legal Disclaimer.

LEGAL DISCLAIMER

- KEEP CONTAINER TIGHTLY CLOSED
- KEEP OUT OF REACH OF CHILDREN
- NOT FOR INTERNAL CONSUMPTION
- FOR INDUSTRIAL USE ONLY
- FOR PROFESSIONAL USE ONLY

Prior to each use of any product of Sika Corporation, its subsidiaries or affiliates ("SIKA"), the user must always read and follow the warnings and instructions on the product's most current product label, Product Data Sheet and Safety Data Sheet which are available at usa.sika.com or by calling SIKA's Technical Service Department at 1-800-933-7452. Nothing contained in any SIKA literature or materials relieves the user of the obligation to read and follow the warnings and instructions for each SIKA product as set forth in the current product label, Product Data Sheet and Safety Data Sheet prior to use of the SIKA product.

SIKA warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Product Data Sheet if used as directed within the product's shelf life. User determines suitability of product for intended use and assumes all risks. User's and/or buyer's sole remedy shall be limited to the purchase price or replacement of this product exclusive of any labor costs. **NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SIKA SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. SIKA SHALL NOT BE RESPONSIBLE FOR THE USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT OR ANY OTHER INTELLECTUAL PROPERTY RIGHTS HELD BY OTHERS.**

Sale of SIKA products are subject to the Terms and Conditions of Sale which are available at <https://usa.sika.com/en/group/SikaCorp/termsandconditions.html> or by calling 1-800-933-7452.

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Product Data Sheet

Sikaflex®-1A
February 2024, Version 01.06
020511010000000008

Sikaflex-1A-en-US-(02-2024)-1-6.pdf

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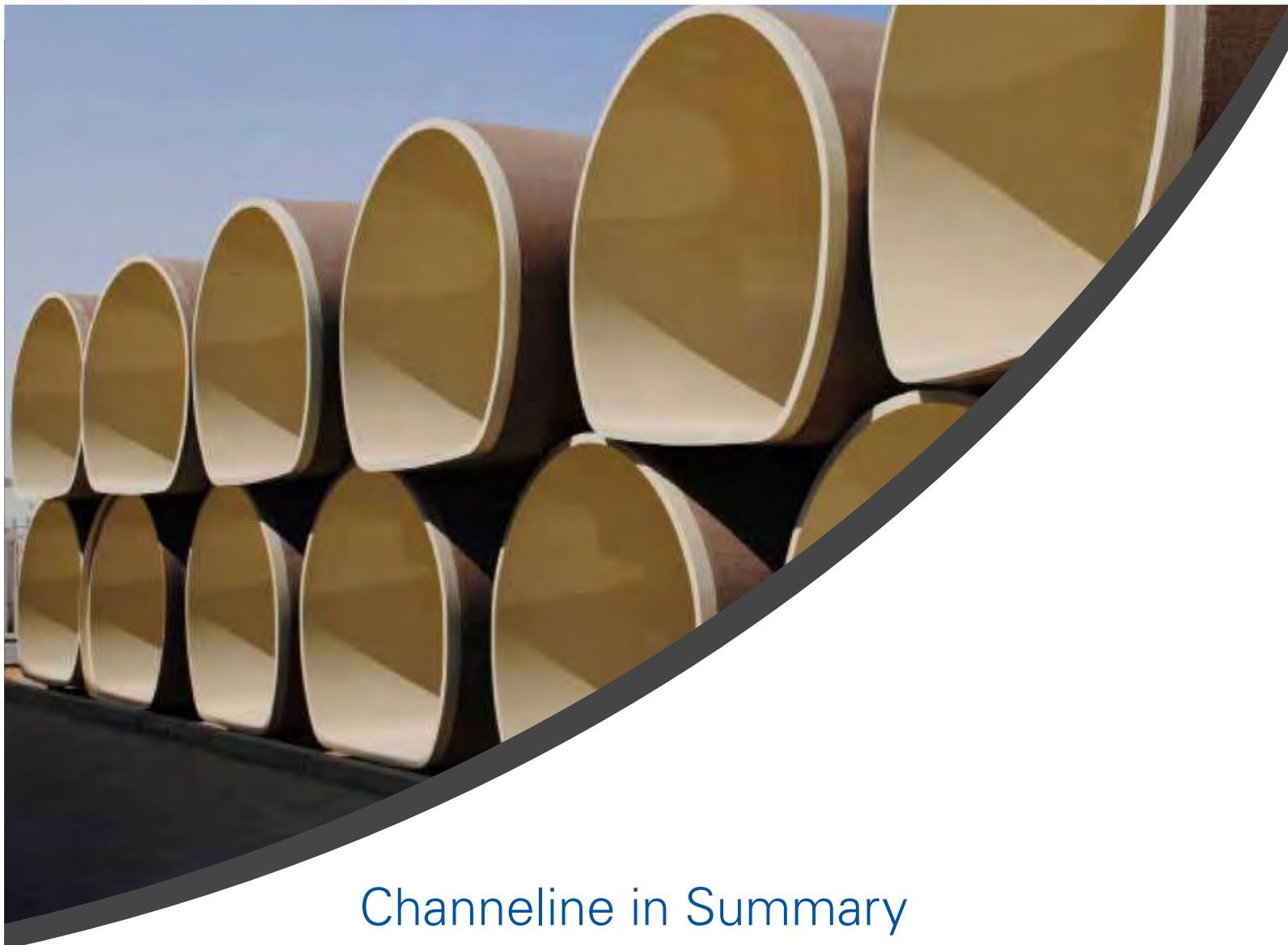
APPENDIX B



CHANNELINE

GRP Structural Lining Systems

Over 4 decades of accumulated experience



Channeline in Summary

Features:

- Custom-Made Production in any Shape or Size Required
- Fully Structural Rehabilitation Solution
- Maximizing Hydraulic Capacity
- Excellent Corrosion Resistance
- Excellent Impact and Abrasion Resistance
- Expected Service Life of Over 100 Years

Applications:

- Sewer Main Pipelines
- Sewer Overflow Pipelines
- Sewer Interceptor Pipelines
- Sewer Inverts
- Storm Water Drains
- Seawater Cooling Pipelines
- Large Diameter Culverts and Tunnels
- Railway & Road Culverts

Introduction

Large diameter pipelines and culverts represent the backbone of any city's utility network for the collection and disposal of sewerage and effective drainage of storm-water.

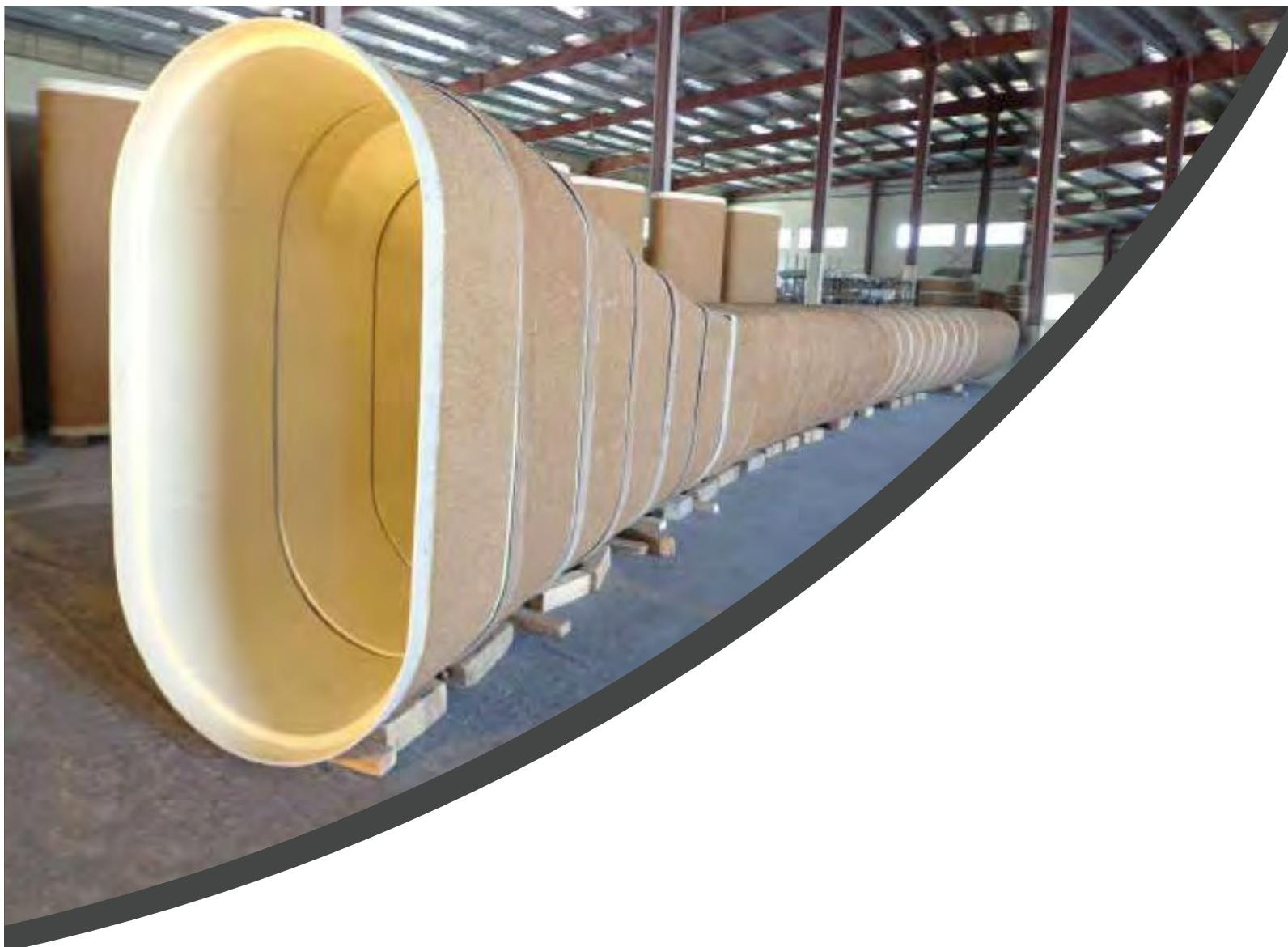
In many cases the fabric of these pipelines, which may consist of brick, stone, concrete or clayware will have been constructed decades ago and although proven resilient, has eventually succumbed to the ravages of time, suffering the effects of H₂S attack or erosion and may even be exhibiting signs of imminent failure due to structural loading beyond that of its remaining capability.

At this point the need arises to consider the means by which the structural rehabilitation of these pipelines and ducts can be achieved whereby a new, 100-year plus life expectancy can be provided with a high degree of confidence.

Channeline has been involved in the provision of specialist **GRP** structural lining elements for just this requirement for over 4 decades during which time we have accumulated an unrivalled degree of experience relative to the rehabilitation of both circular and non-circular large diameter buried pipeline structures worldwide.

We have grown to be a global business based on the integrity and performance of the product we design and manufacture. We are proud of our heritage and committed to serve our existing and future customers in the water and wastewater industries.





Engineered to Perfection

The general concept of the Channeline product is that a remarkably stiff and strong panel section is constructed, but with a relatively thin wall. The product differs from that of standard **GRP** hand or filament wound pipework in several fundamental and important ways. Normal **GRP** pipework consists of windings of layers of resin-saturated glass, which is impregnated with sand, achieving its stiffness by building up ever increasing wall thickness. Channeline however, derives its strength and stiffness through a different method, employing the mechanics of sandwich panel design, incorporating a unique polymer and aggregate core.

Product

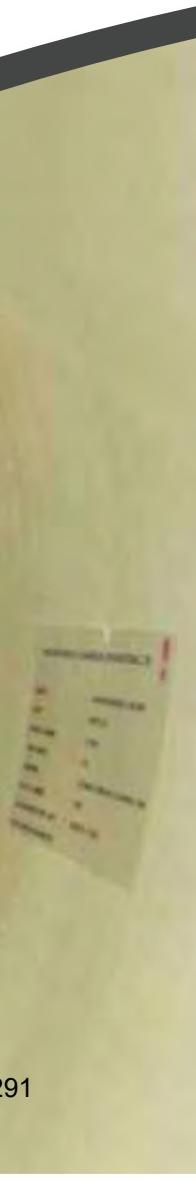
General description of Liner Construction

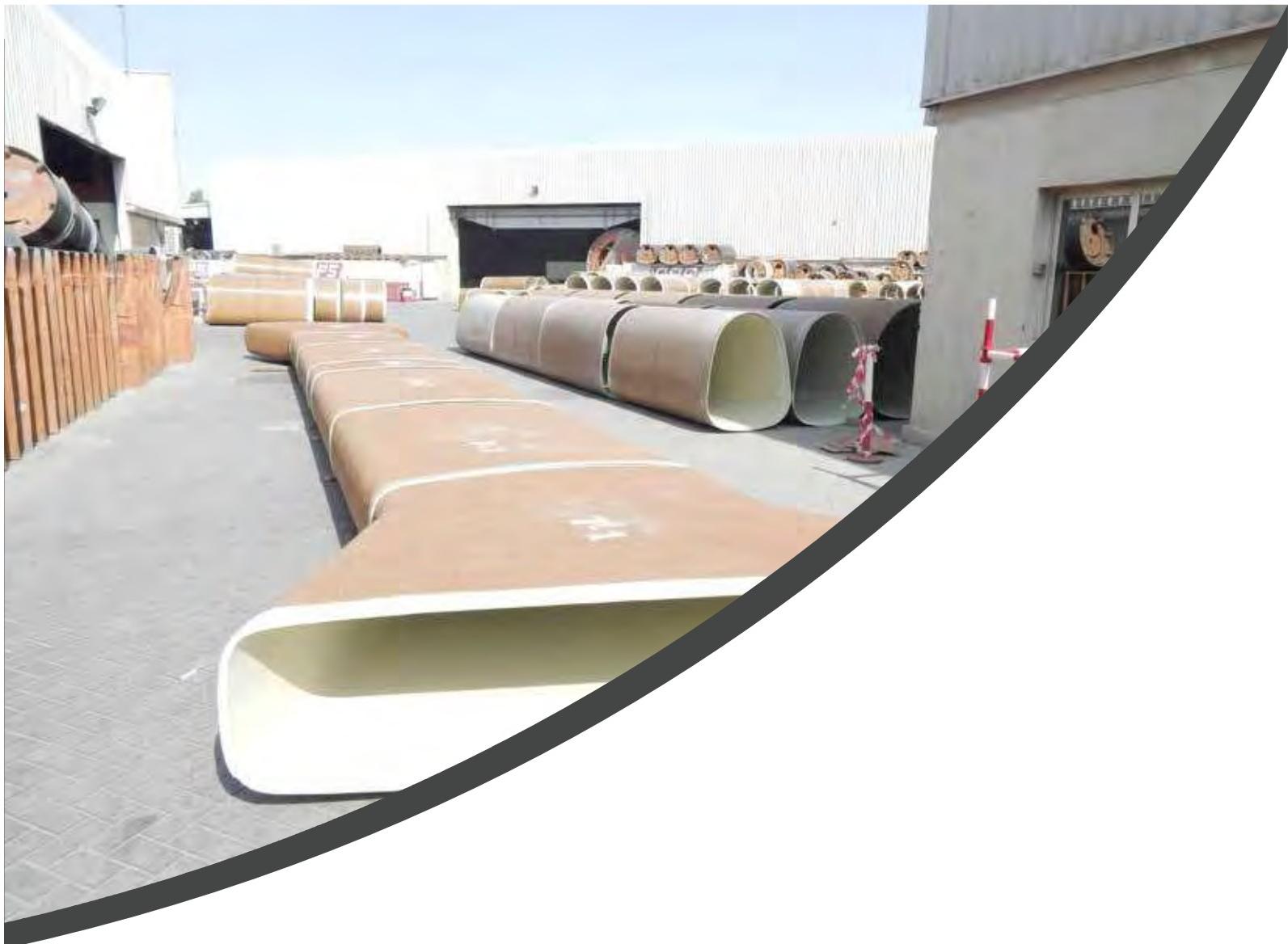
The first stage of Channeline manufacture is an inner sandwich structure incorporating a 1.5 mm (0.059") corrosion barrier on the inside surface which is manufactured from high grade surface veil precisely impregnated with Isophthalic or Vinyl-Ester resin, followed by several layers of thoroughly impregnated multi-axial engineered fabric and CSM, forming the inner sandwich skin.

Next, comes a central core, comprising of carefully metered amounts of blended sand and resin which is pre-batched, mixed and evenly applied to the exact thickness required.

The outer sandwich skin is then formed using several further layers of multi-axial fabric, CSM and resin, with the outer surface being treated with a bonded graded aggregate to enhance adhesion to the annular grout, which is used during the installation phase.

The sandwich construction process is continuous, and carefully monitored and controlled ensuring exceptional bonding of all layers throughout the process.





Shapes & Sizes

There really is no theoretical limit to the shape and size of Channeline panel that can be effectively manufactured. Because Channeline technology includes the evolution of multi-piece segmental construction, where necessary for transportation, even very large, peculiar shaped rehabilitation projects can be accommodated using Channeline product.

Product

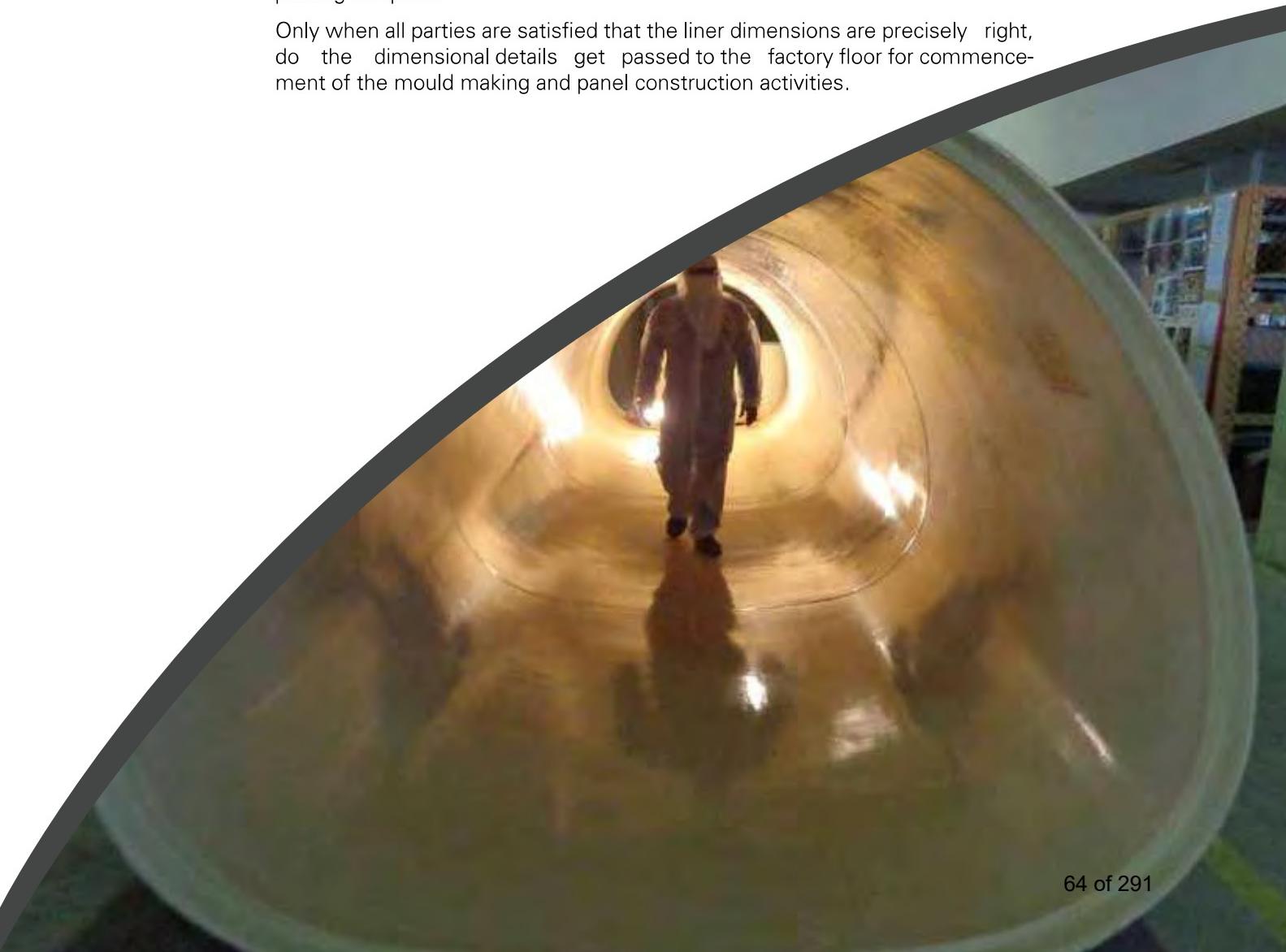
The fact is, that the sheer ingenuity of the designers and constructors of large buried structures of by-gone days never ceases to amaze us.

Those most commonly encountered are:

- Circular
- Ovoid
- Egg shaped
- Elliptical
- Flattened Elliptical
- Arch barrel
- Box shaped
- Flattened Box shaped

The Channeline segments for each rehabilitation project are custom made to provide a precise fit to the size and shape required. The information needed to achieve this is obtained from a detailed site survey undertaken by the Authority, Contractor and/or Channeline representative, together with the preparation of a proving template.

Only when all parties are satisfied that the liner dimensions are precisely right, do the dimensional details get passed to the factory floor for commencement of the mould making and panel construction activities.





Characteristics

Channeline Structural **GRP** Lining Panels are manufactured to fully comply with the WRc materials standards for **GRP** (Guidance note WIS 4-34-02) and are also manufactured in accordance with BS5480, ASTM D3262 & ISO 16611:2017

Mechanical Properties

At the outset of each project, a detailed design analysis is undertaken, taking into account all necessary criteria such as depth of pipe, condition of existing pipe, ground loading, the likely effect of external water etc. to determine the exact requirements for the liner design. Design work is generally undertaken in compliance with the requirements of the latest edition of the WRc manual (other standards may be used) which then establishes the liner thickness needed to produce a Type I, Type II or Type III liner (see Technical Section).

This analysis takes into account the short and long-term mechanical properties such as:

- Flexural Modulus
- Bending Stress
- Tensile Stress

Panels of any required liner type strength and stiffness can be produced using the Channeline sandwich construction method.

Corrosion Resistance

The deterioration of a sewer or culvert is often accelerated by corrosive gasses and the oxidization of Hydrogen Sulfide into sulfuric acid.

Soft mortar is not always easily identified by CCTV surveys. For Man Entry sewers manual inspection is recommended.

Most structural failures in sewers are caused by insufficient tensile capacity. Corrosion will contribute to this reduction in strength.

The resins used by Channeline are highly resistant to sewer gases and most trade effluent.

A detailed corrosion resistance guide is available from your Channeline Representative or can be downloaded from our website.

Barcol Hardness and Abrasion Resistance

The high quality gel coat resins and surface veils used in the manufacture of Channeline panels provide an exceptional degree of resistance to impact and abrasion. Wet abrasion testing comparisons with other liner methods show impressive and superior results. The Barcol hardness of cured Channeline material is Shore D 30.



Characteristics

Hydraulic Capacity

The hydraulic capacity of a sewer or culvert is dependent on the cross sectional area of the unit and the surface roughness of the sewer or culvert wall. Collapsed and protruding sections of the host pipe wall can greatly reduce the cross sectional area and increase the friction coefficient of the unit, thus dramatically reducing its hydraulic capacity.

A feature common to nearly all sewer and culvert renovation processes is that the internal surface roughness of the existing sewer or culvert is reduced, i.e. improved from a hydraulic point of view. Thus, although there is frequently a loss of cross sectional area associated with the renovation work, this is generally counteracted by the improved flow-carrying characteristics of the upgraded sewer.

The surface roughness is determined by a roughness coefficient 'k' or by the Mannings friction factor 'n'.

The surface roughness coefficient 'k' can vary from 3mm (0.118") for a brick lined sewer in poor structural condition with mortar missing to as high as 152.4mm (6") for irregular coarse stone masonry culverts. Inter-mediate values of surface roughness are applicable to older and defective concrete and clayware pipes.

Channeline will always provide an improvement to the flow capacity of a lined large diameter pipeline or culvert. Generally, this is in the range of 12% to 25% even though the cross sectional area of the structure has been reduced slightly.

Using the Manning method, the 'K' value of Channeline is 0.23% and the coefficient value of 'n' is 0.009. By the equivalent Colbrooke White method the K_s value of a Channeline liner is 0.03 in clean flow or 0.6 if allowance for slime is required.

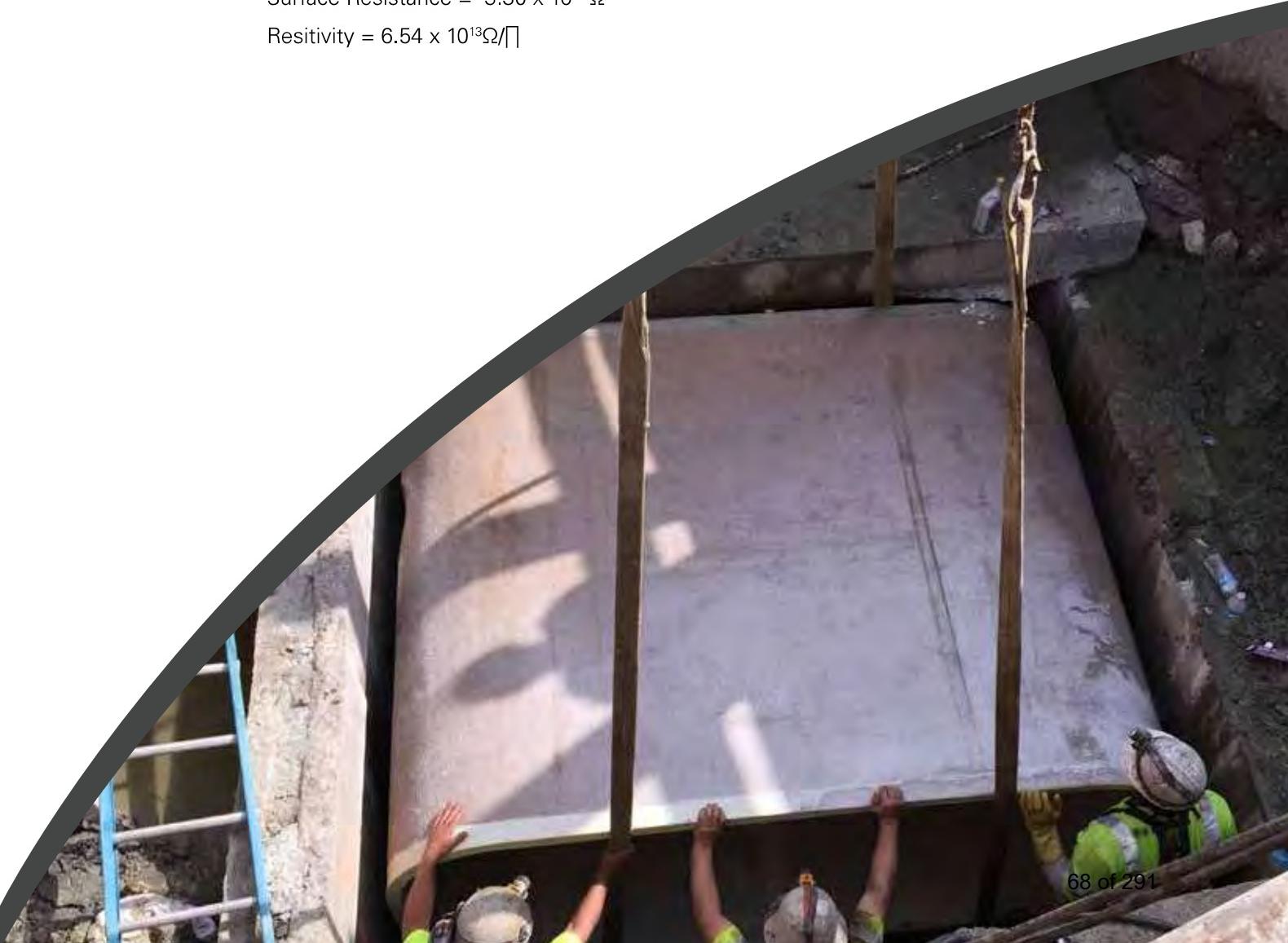
Self Cleaning

The ability of a sewer to enable silt deposition is a function of the surface roughness of the structure, which causes the flow to slow down at the liquid/pipe wall interface. Experience has shown the extremely smooth nature of the Channeline **GRP** material mitigates the flow/pipe wall friction so that under normal flow conditions pipelines and culverts once lined, are effectively self cleaning.

Electrical Properties

Surface Resistance = $3.30 \times 10^{12} \Omega$

Resistivity = $6.54 \times 10^{13} \Omega/\square$





Durability

Channeline pipeline rehabilitation liners are designed to last. The standard product design ensures a minimum 100- year life.

Sufficient empirical durability and performance data has now been accumulated by Channeline to justify design life predictions in the order of 50 to over 100 years under most pipeline operating conditions.

Fittings

For the occasional rehabilitation project, there is a requirement for an intermediate change due to the presence of a reducer in the pipeline, the lining of a dead end, or a large diameter Tee entry.

Channeline can design and fabricate any desired fitting for such projects including:

- Concentric Reducers
- Eccentric Reducers
- Dished Ends
- Y pieces
- Equal tees
- Reducing Tees

Channeline Product Range

Channeline-Standard

Standard Channeline panels are manufactured with a socket and spigot joint, with adequate clearance and tolerance such that one panel connects easily into the next when positioned into the pipeline or sewer. For many projects, Channeline panels are manufactured in 2.44 meters (8.0 ft.) long solid sections.

Optional in-line jointing can be facilitated where it is necessary to provide a liner of maximum external diameter and minimum annular gap, thus eliminating the 10mm (0.4 inch) allowance required for the socket overlap.





Channeline Multi Segmental

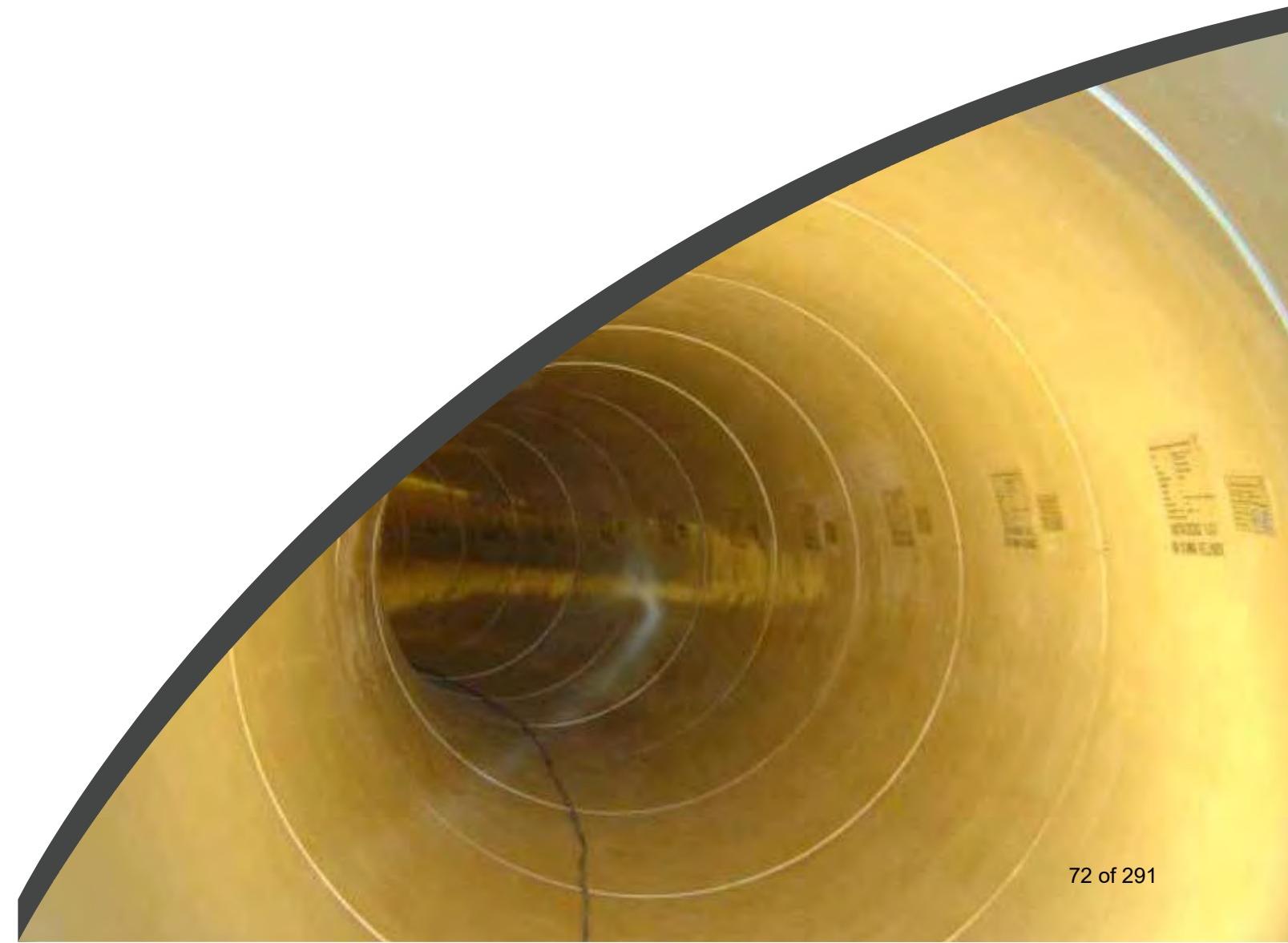
Often due to either transportation problems or difficulties associated with access to the pipeline (e.g. entry only permitted through manholes), or in the case of a particularly large structure, it is desirable for the panels to be manufactured in two or more longitudinal sections which are site bonded above or below ground using our patented structural tongue and groove jointing system, positioned at the points of intersecture, i.e. at the points of zero bending.

Channeline-CL

This unique made to measure moulded Curved Liner is complementing the Channeline range, which offers a unique solution for lining bends for any size or shape with an integrated gasket seal.

Most older sewers and pipelines exhibit unintended deviations or deliberate direction changes, often being of a short radius nature. The Channeline socket and spigot jointing method allows for the alignment of each sequential panel installation to accommodate small direction changes and offsets quickly and easily.

Where more severe direction changes and short radius bends are encountered in the pipeline Channeline can provide computer modelling and the fabrication of custom built short sectional or lobster type bend sections.





Channeline-SL

This Slip Liner version allows for slip-line installation (non-man-entry) in live sewer flow conditions, reducing installation costs both in time and elimination of over-pumping.

Our in line high strength joints are combined with a lubricated silicon filled rollover gasket, providing ease of connection and a high integrity pressure tight seal.

Easy to position, with our mounted centralizing skids, and easy to jack straight line lengths of ≈350 meters / 1200 feet and more can be accommodated in a single insertion process.

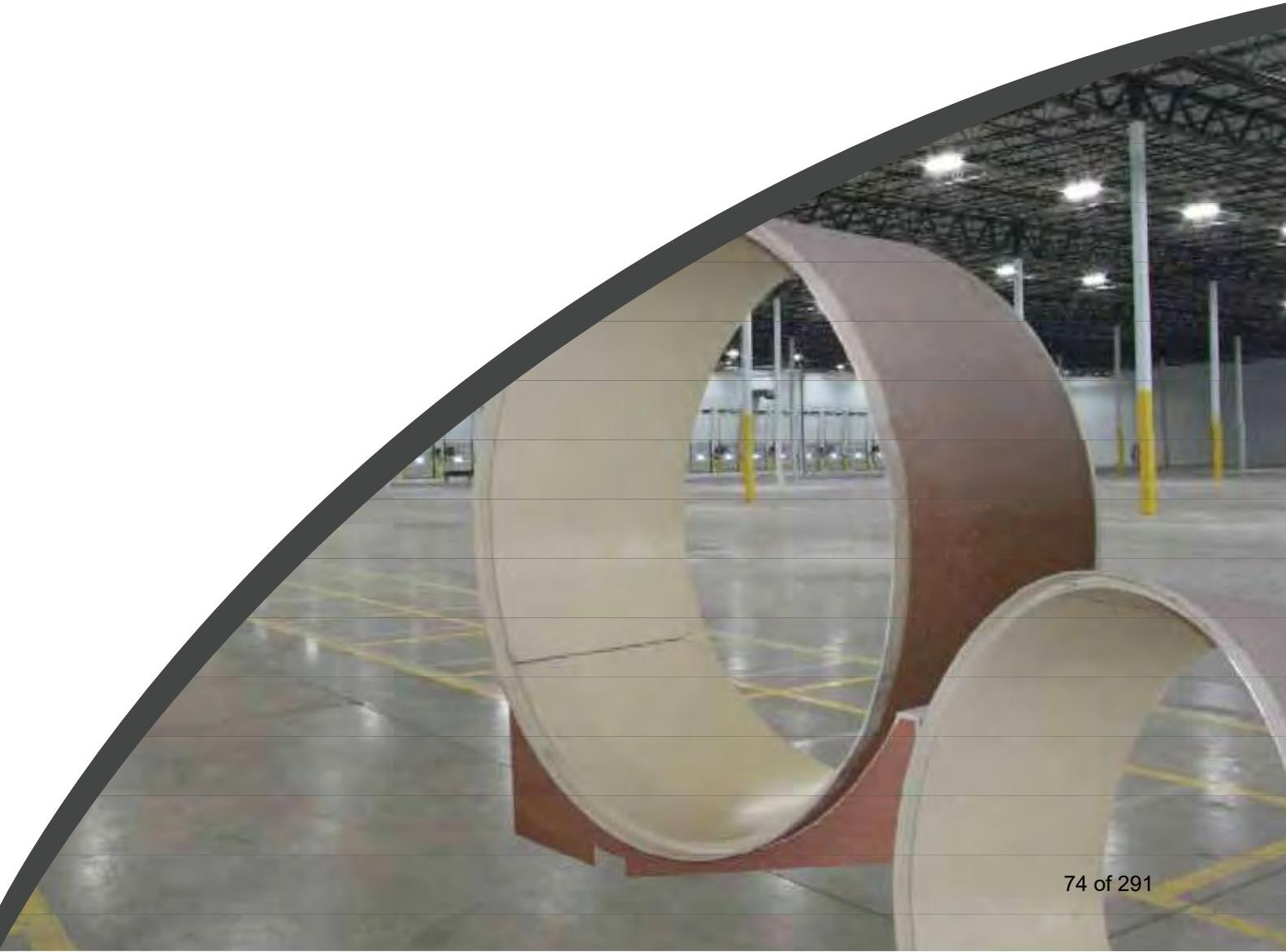
Channeline-SL-3

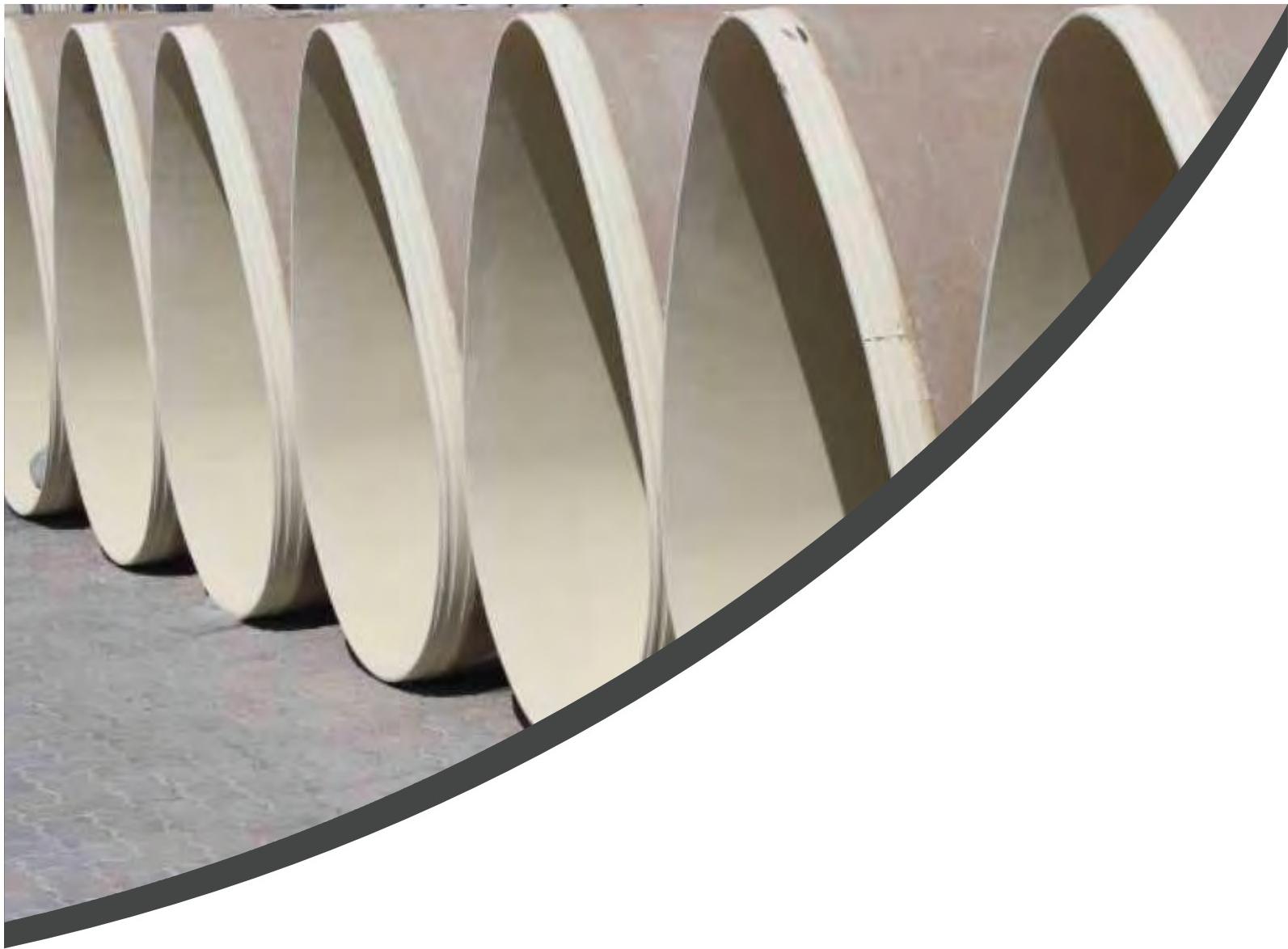
The Channeline SL-3 system combines the advantages of Channeline SL, allowing for non-man-entry and live flow installation, with the benefits of multi segmental delivery, allowing for reduction in transportation costs and accommodating for construction constraints.

Channeline Lateral Connections and Fittings

Many sewers and pipelines are constructed with incoming lateral connections throughout the length of the structure.

The rehabilitation of these lateral connections is easy and straightforward with the Channeline liner product. Laterals can be connected with mesh and mortar or where necessary, for severely degraded lateral connections repair mortars and **GRP** inserts can be prefabricated, installed and subsequently bonded to the main sewer liner to provide a smooth, durable solution.





Installation

Channeline pipeline rehabilitation liners are installed world-wide by a network of trained and approved specialist contractors, experienced and trained in confined entry.

For a list of approved contractors in your area please ask your local Channeline sales representative, or contact our website.

Installation Techniques

The pipeline or duct to be rehabilitated will first have been de-silted, cleaned and surveyed and the information gathered from which the design dimensions of the liners will have been determined.

Once manufactured, the liner material elements will be trucked to the job site, offloaded and stored in a convenient location close to the job site.

Access pits will have been prepared at suitable locations along the length of the pipeline and the crown of the pipeline removed so as to allow insertion of the Channeline sections.

The Channeline segments are then lowered into the pipeline opening using a suitably rated crane until they rest in the invert of the pipeline at the pit location

A special hydraulic trolley unit is then used to transport each liner segment along the length of the host pipe to the required location.

Once in position, the liner segment is centralized and chocked using hardwood wedges.

Each liner segments connects easily to the previously installed one by means of the socket and spigot joint.

Grouting

During the installation of the Channeline liner segments, the sections of liner are centralized in the host pipe bore so that an even annular gap is evident between the liner and the pipe wall around the circumference of the liner.

This annular gap is subsequently filled with a low viscosity, free flowing, rapid setting, and high-strength grout.

As with all grout in place liners, grouting operations should be conducted with an understanding of the principals of buoyancy and flotation given the fact that the annulus between the liner and the host pipe is being effectively filled with a liquid and the liner forms a flexible hollow tube.

The practicalities of buoyancy and flotation can be dealt with in several ways, but the most common is to undertake the grout filling of the annulus in three or more stages, dependent upon the height and diameter of the liner.

This normally involves the installation of grout in a first stage to approximately the 5 O'Clock to 7 O'Clock portion of the annulus, which is then left to cure so as to "lock in" the base of the liner at the pipe invert.

The grouting of subsequent stages or "lifts" is then conducted, with an adequate curing time in between operations, commonly toward the spring line, and then in one or more subsequent stages to the top of the pipe.

Upon completion of the grouting process, the grout port holes are sealed by plugging using the liner cores taken from those locations and an epoxy adhesive, or other acceptable equivalent.

Channeline technical staff should be consulted for guidance on all grouting issues and a full grout specification and installation procedure is available upon request from any Channeline office.





Technical Section

Sewer Defects

The need to rehabilitate a sewer or storm water drain arises following the cognizance of the fact that the load bearing capacity of the pipeline either has, or is shortly to, become insufficient to continue to support the gravitational forces acting upon it. In short, if its not repaired then it will probably collapse.

An understanding of the failure mechanism of the variety of different shaped pipeline structures is important in determining the design principals of a rehabilitation liner and much of the work necessary to understand this process was covered by the WRc and Channeline during the studies conducted in the 1980's.

For example, it is known that as a pipeline

structure become weakened by corrosion, positive bending moments act to force the sewer to deform inwards, whereas negative bending moments act to force the sewer outwards.

This is clearly demonstrated in the photograph opposite, where the effects of both positive and negative forces are clearly evident.

For a circular profile, there are 4 points of intersecture. For an egg profile there are 6 points of intersecture.

This is why, for segmental liner design, Channeline uses patented "Tongue and Groove" longitudinal joints which are positioned at the points of intersecture, i.e. at the points of zero bending.

For WRc Type 1

Composite design this is an important factor of the installation process as it is desirable to ensure a thorough and even load transfer between the existing pipe and the liner.

In this case a high strength structural grout is recommended such as that produced with a mix of Ordinary Portland Cement, Fly Ash and water, in the appropriate quantities. Correctly mixed and installed, this will provide a grout strength in the range of 20Mpa (2900.75 PSI) to 30 Mpa (4351.13 PSI) at 28 days.

Where deemed necessary by the contractor, consultant or customer, quantities of plasticiser and non shrink additives may be included in the mix design.

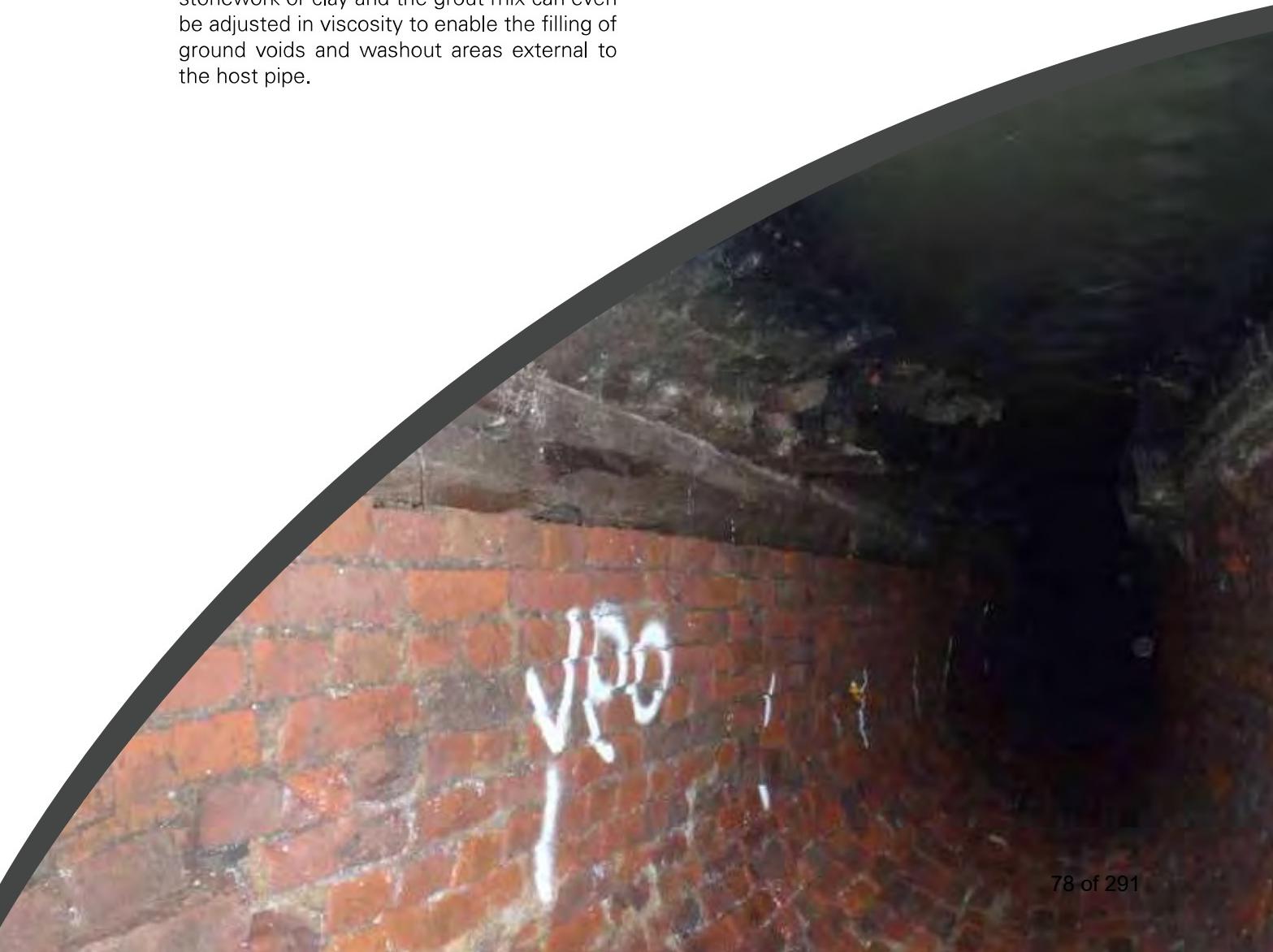
The grouting process also has the significant technical advantage of implementing the filling of any voids or defects in the existing pipe, such as missing mortar or brick, cracks in stonework or clay and the grout mix can even be adjusted in viscosity to enable the filling of ground voids and washout areas external to the host pipe.

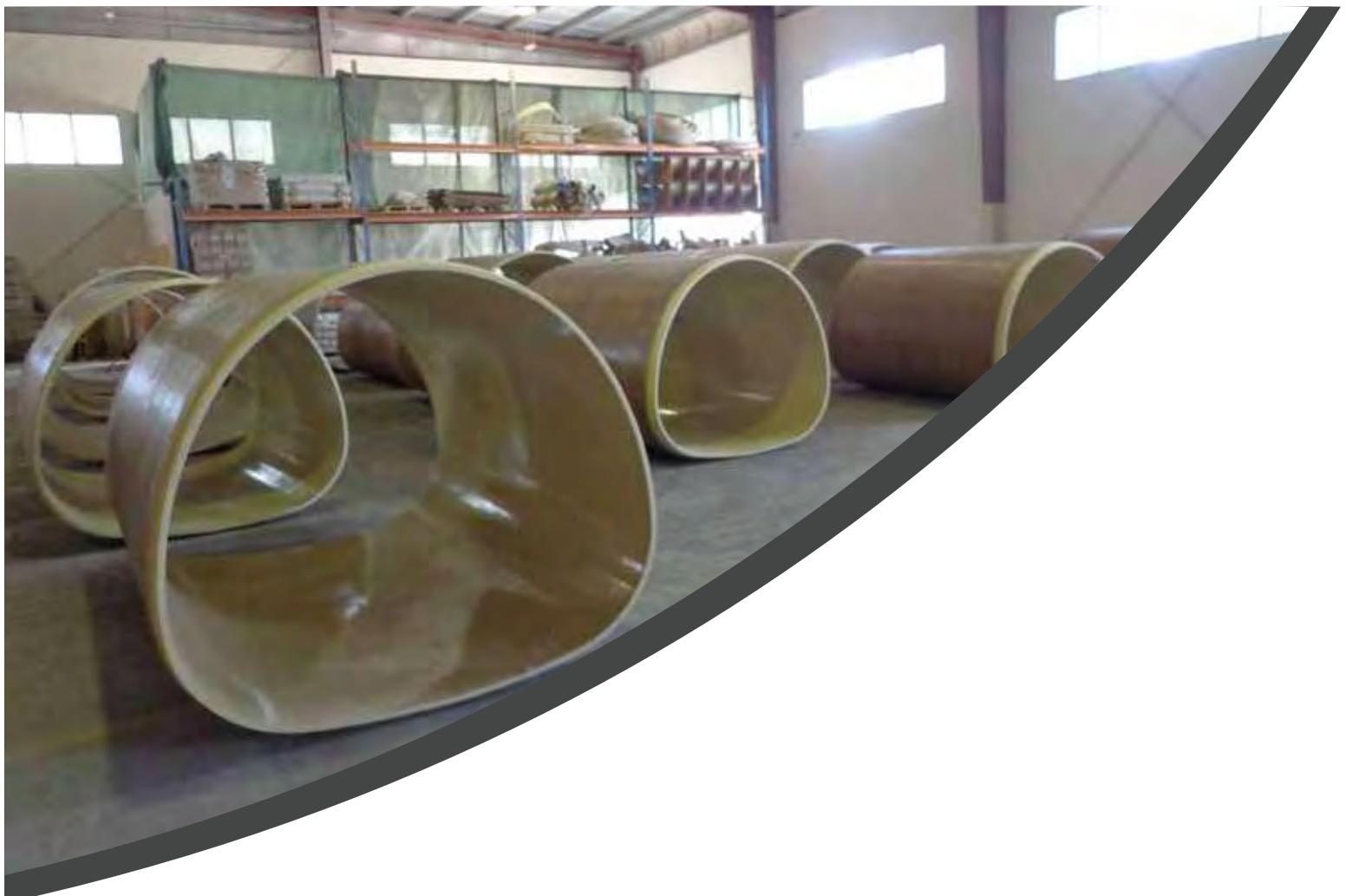
The first stage of grouting involves the establishment of bulkheads at the ends of the section that has been lined. This is achieved using a rapid setting cementitious mortar, or brick construction with vent tubes.

Once this has been done, grout ports are drilled at intervals along the crown of the liner through which the grout can be injected.

Grout mixing is conducted above ground, using a combined mixer/pump unit, with either piston or screw pumps and continually pumped through grout hose down into the host pipe section and into the grout ports.

Pumping is continued at one location until the desired level has been achieved in the annulus, which can easily be determined by "sounding" the liner with a rubber or wooden mallet. Grouting pressures are in most cases minimal, at less than 0.5 Bar. (7 PSI).





WRc Type II (stand alone) design

WRc Type II design calculations examine the safe external hydraulic working head limited by stress and deflection using Timoshenko theory for flexible pipe design. It assumes that no bond will exist between the liner and the existing structure and is based on standard critical buckling formulae for external hydraulic loadings with an enhancement factor for external support. It does not examine the effects of vertical pressure from road loading and overburden. In some cases it can be assumed that the existing sewer will carry the road loadings in other cases additional calculations will be required. WRc state that Type I design method can be used to check road loading and overburden for **GRP** but they do not consider CIPP (Cured in place pipe) and thermoplastics as suitable for composite Type I designs. WRc advise that any cavity between the liner and the Host pipe and the surrounding soil may require filling with grout to allow an enhancement factor to be used.

For large diameter (Man Entry) sewers thermoplastics such as PVC and Polyethylene become impractical to use for Type II designs

because of their relatively low long term modulus and resulting thickness.

The relative thickness of a 1.5 metre (60") diameter liner with good external support (enhancement factor of 7) and safe working external head of 3 metres (10') based on Type II design method are 17.5 mm (0.057") for **GRP**; 30 mm (0.098") for CIPP; and 72 mm (0.0236") for Polyethylene and PVC.

For non-circular liners, formulae are provided in the WRc manual. For circular liners tables are included, alternatively the formulae used to construct tables based on the flexural modulus of the liners can be used and is included in the description of method of design. For Type II designs long term (100 year) values should be used.

Where a combination of Type I and Type II designs are used, the design is referred to as a Type I design with a Type II check. For these categories the linings must have the required characteristics for both methods. **GRP** is the only material currently listed by WRc as suitable for both Type I and Type II designs.

WRc Type-III (corrosion barrier) design

Type III design is a non structural permanent shutter. This design can be considered only if no external ground water is present or is likely to build up. It will give corrosion protection and improvement in the flow capacity only. It is not considered as giving improved resistance to ground and traffic loadings.

Type III liners are rarely used today due to the small cost advantage gained over a structural lining and possible risk of blockage.

Materials suitable for Type I, Type II and Type III design methods are listed in WRC Rehabilitation Design Manual section 111/37 table 5.1

When renovating a sewer or culvert it is important to establish the design criteria and the cause of deterioration. It is also important to note that after renovation, ground water levels are likely to increase.

Both Type I and Type II design methods use mechanical properties at 100 years plus a factor of safety of 2 to give a minimum design life of 100 years.

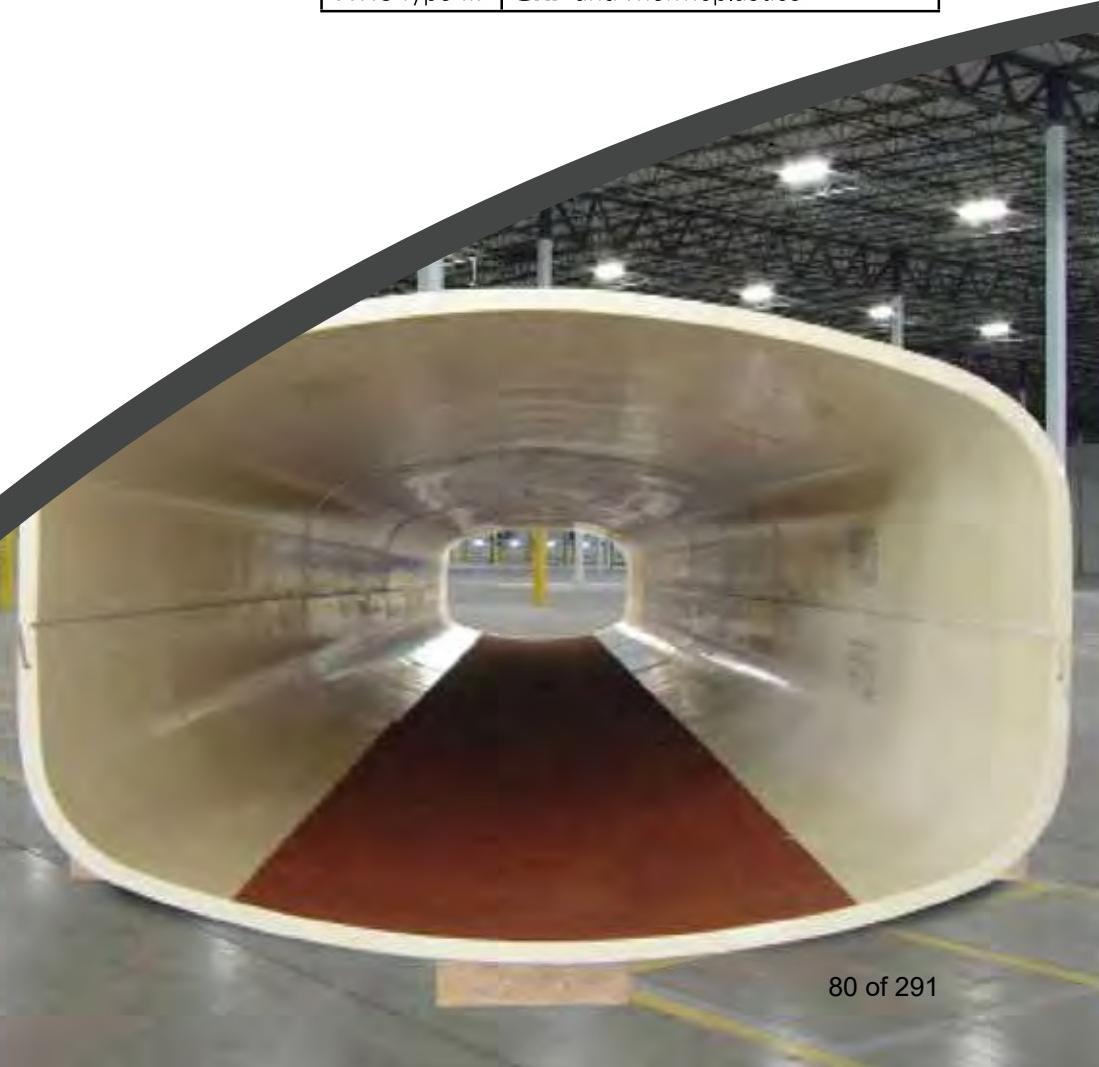
Where ground water is likely to be present it is prudent to combine both Type I and Type II designs using the 100 year long term mechanical properties for both design methods.

Materials listed as suitable for WRc Type I, Type II and Type III design methods

The suitability and selection of materials for renovation is as important as the suitability and selection of the design method if the required design life is to be achieved.

Suitable materials per WRc

Design Method	Materials Suitable For Long Term Structural Design
WRc Type I	Gunite Glass Reinforced Cement (GRC) Polyester Resin Concrete (PRC) Glass Reinforced Plastic (GRP)
WRc Type II	Polyethylene Glass Reinforced Plastic (GRP) > 5mm. thick Cured in place liners > 6mm. Polypropylene
WRc Type I & Type II	Glass Reinforced Plastic (GRP) > 5mm thick
WRc Type III	GRP and Thermoplastics





From the table it can be seen that cement based systems are listed suitable for Type I designs only. Cured in place and thermoplastics are listed suitable for Type-II design only and **GRP** is suitable for Type I, Type II and Type III.

Resistance to corrosive attack

Very often the deterioration of a pipe or culvert is accelerated by corrosive gases and the oxidization of Hydrogen sulphide to sulphuric acid. Soft mortar and/or loss of mortar at the joints in brick built sewers are good indications of corrosive attack. These conditions are not always easily identified by CCTV surveys.

Where corrosive attack is evident the selection of a suitable lining material is

necessary whether it be for Type I or Type II design method. WRC list **GRP**, CIPP and Thermoplastics are highly resistant to acids, sulphates and alkalis.

They list cementitious materials as resistant to alkalis but not acids.

Sulphate resistant cements are resistant to alkalis, natural sulphates, but they are not resistant to sulphuric acid.

Resistance to Wet Abrasion

Extensive wet abrasion testing was carried out by both Northumbrian Water and WRC. Relative abrasion resistance is listed in the WRC Rehabilitation Design Manual as a relative number but actual WRC wet abrasion test results are shown opposite showing % loss of thickness.

Comparative Wet Abrasion Results

MATERIAL	AVE % LOSS OF THICKNESS
Polyethylene	0 % (surface roughened and K _s value reduced after testing)
GRP (Channeline)	0.2%
Cured in Place (CIPP)	0.315%
PRC	0.365%
Cement based (AC, OR CONCRETE ETC)	15%

Flow Capacity

There will normally be a reduction in cross sectional area of the sewer after renovation. However when polymeric materials such as **GRP**, CIP, Polyethylene etc. are used it is normal to experience an improvement in flow capacity due to the low K_s (Colbrooke white) value of 0.03

WRC recommend the Colbrooke -White method. as giving the best evaluation of flow capacity of sewers currently available. They list a range of K_s values for both deteriorated and new sewers in various materials. However Manning should give comparable results.

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The importance of Shear Bond at the interface for WRC Type I designs

For liners with low tensile stress values, tensile failure will generally occur before shear failure of the interface bond. For high tensile materials such as **GRP** (FRP) shear failure at the interface will generally occur before the tensile stress of the liner is exceeded. WRC recommend that both shear and tensile strengths be examined

For Type I composite structures, the resistance to shear at the grout /liner interface is of major importance. Prior to the publication of the WRC design manual, WRC undertook detailed evaluation and shear testing of a wide range of materials with different grouts. An abbreviated table of average bond shear stress test values from these tests is shown overleaf.

The shear bond values are taken from extensive testing of flat plate samples. WRC concluded that the shear bond strength at the interface was proportional to the compressive strength of the grout used, It therefore follows that as the compressive strength of the grout increases with time, so does the bond strength.





Mechanical Properties of Channeline Products

	Flexural Modulus		Bending Stress		Tensile Strength	
	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
GRP (Channeline) N/mm²	10,000	6,549	82.74	60	98	52
PSI	1,450,377.00	949,852.10	17,404.50	12,000.42	14,213.70	7,541.96

For calculation purposes the 50 year values are generally used.

The long term properties are based on physical testing in accordance-with the relevant BS, DIN, ISO and ASTM standards.

Summary

The mode of failure and collapse of man entry sewers and culverts is generally due to inadequate tensile capacity of the structure. This may be caused by corrosion resulting in softening of the mortar joints, abrasion infiltration or excessive road or hydraulic loading. It can also be due to adjacent piling or tunnelling works. In many cases the duty of the road has increased with time and the sewers have exceeded the original design loading. It is rare for sewers to collapse due to failure in compression.

The critical loading on sewers and culverts is generally external but surcharge loads on sewers and culverts are not uncommon and may expose inadequate tensile hoop strength of the structure. In many cases tensile fractures both longitudinal and circumferential and loss of shape to the soffit are quite visible. These give a good indication of the critical loading. In other cases, particularly with brick built sewers with soft or missing mortar in the joints, there may be little if any visual evidence of the problems when viewed by CCTV. For large man entry sewers and culverts routine manual inspection is strongly recommended. If external head is being relieved by infiltration at invert level it is reasonable to assume that cavities, caused by the infiltration, exist between the brickwork and the surrounding soil at the sidewall of the sewer which may result in a K value approaching zero and therefore induce high positive bending moments in the structure. In cases like this collapses will sometimes occur when there is a sudden soil settlement and horizontal load is transferred to the sewer wall in the positive bending moment areas.

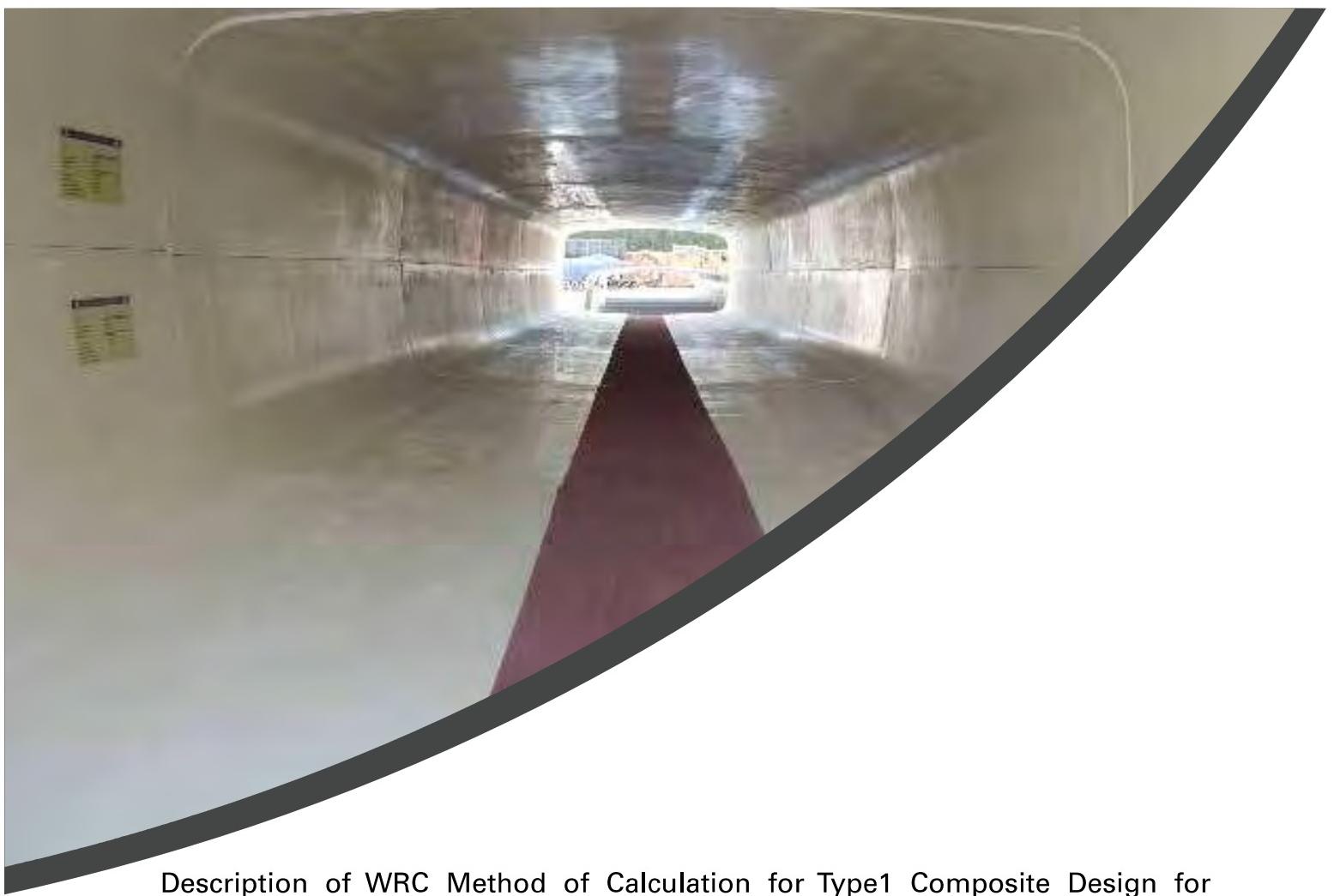
The prime objective of renovation design must therefore be to add sufficient tensile capacity to the sewer to resist a wide range of external loadings. In certain cases induced stress due to surcharge loadings must also be considered.

If it is known that a sewer or culvert is structurally inadequate to carry current and future loads it is not sufficient to adopt a wait and see policy. Emergency repairs are not cost effective and do not normally solve the real problem. Claims from flooding damage due to collapses can be high.

If a sewer is known to be structurally inadequate, it needs renovating.

The publication of the WRC Sewerage Rehabilitation Manual has enabled Water Company, City and Consulting Engineers to adopt and budget for ongoing sewer renovation programs. It was first published in 1984 following five years of extensive research work and trials. It has been updated recently and enables engineers to select and specify suitable and proven design methods and materials for renovation for various conditions.

Engineers are also able to use the principles of the WRC design manual for non-standard culverts and sewers.



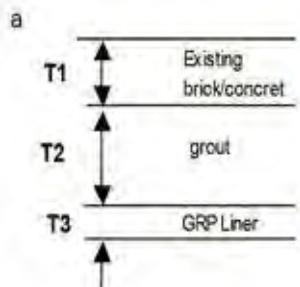
Description of WRC Method of Calculation for Type1 Composite Design for Standard and Non Standard Culverts

As defined in WRC rehabilitation manual but extended to cover curved arch forms of larger diameters.
General engineering design method for loading :

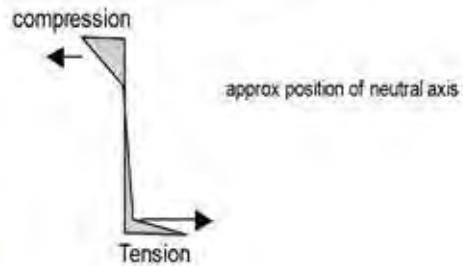
1. From basic principles, the induced maximum bending moment acting on the culvert can be calculated using standard bending formulae.

Calculations for induced tension in liner

Lever arm calculation



Stress distribution diagram



$$\text{Lever arm 'LA'} = 0.67 \cdot T_1 + T_2 + T_3/2 = 114.6 \text{ mm}$$

$$\begin{aligned} \text{Tension in Liner 'F'} &= \frac{\text{Max bending moment 'M'}}{\text{Lever arm 'LA'}} \end{aligned}$$

2. Any increase/decrease in lever arm will respectively decrease/increase the force transferred to the lining. (Typical principle of I beam).

FORCE $F = BM/td$

3. By comparing the force F transferred to the liner with the tensile capacity of the liner, the factor of safety of the composite structure can be considered. The centre core (annular concrete or grout) must be of sufficient strength min 9 MPa (1305.34 PSI) to transfer load to the liner through the composite structure.

From the WRC manual

Tensile capacity T_c = tensile strength x thickness and the factor of safety = Tensile capacity force in the Lining.

For high tensile materials such as **GRP**, composite design failure will generally be due to shear at the panel grout interface and not tensile failure of the liner. The limitation of the composite design is the ability of the panel / grout interface to resist shear during bending. WRC recommend that in these cases a limit be placed on the design by incorporating the shear stress formulae for a curved beam into the standard tensile capacity equation.

The shear strength formula for a curved composite beam

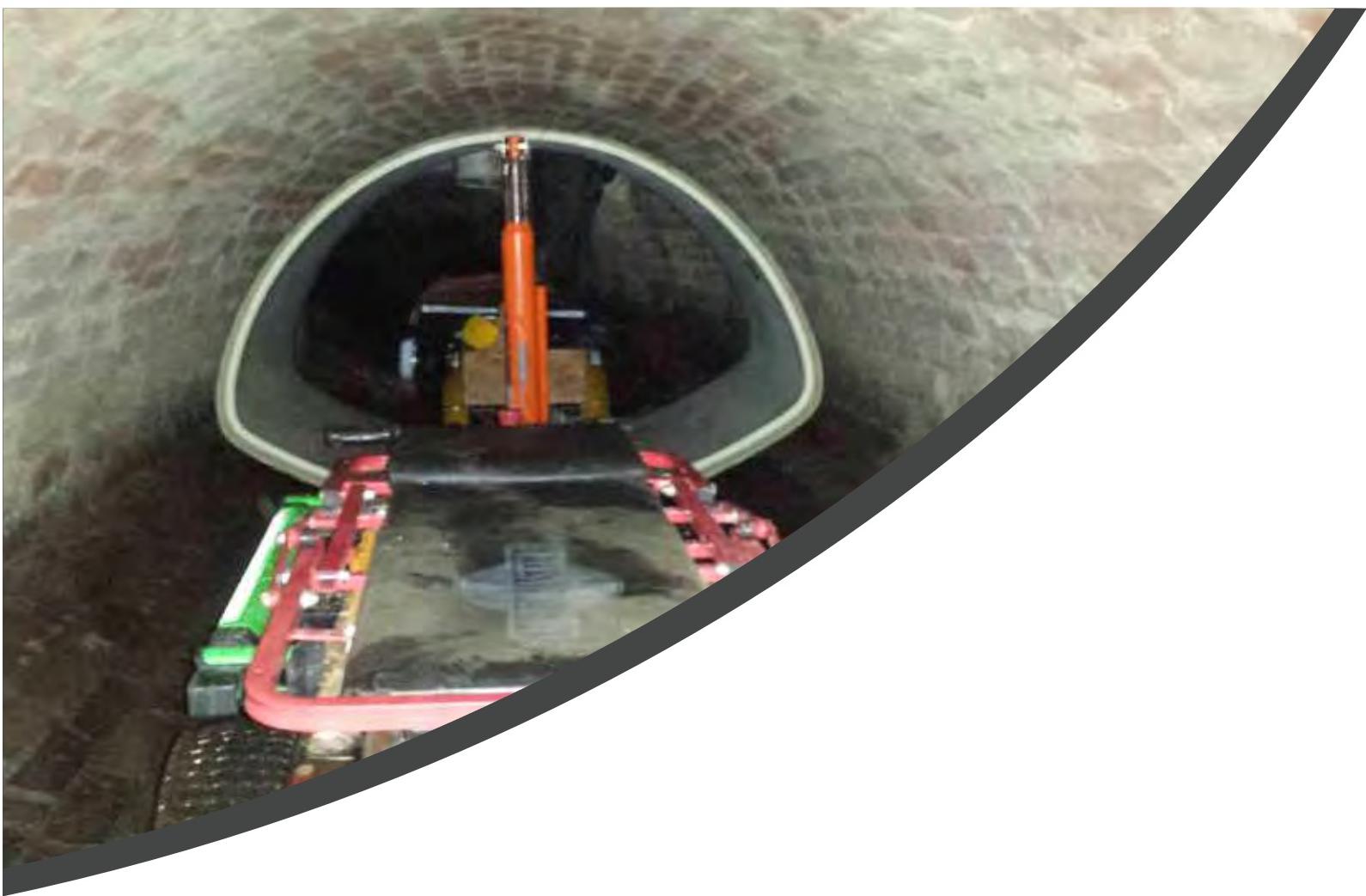
$$= (7r / 8 \times \text{lowest shear bond value for flat plate}(0.68 \text{ MPa}(98.62 \text{ PSI})) \times \text{Dia} / \text{thickness})$$

$$= 0.267. \text{ Dia} / t \text{ (as per latest edition of the WRC SRIVI)}$$

The lowest shear bond value used for calculation purposes is 0.68 MPa(98.62 PSI)-The lowest value found from testing a range of both **GRP** and Cementitious materials.

WRC's research program for structural renovation of sewers included extensive testing of the shear strength at the panel grout interface and formed the basis of the design manual. The shear bond values are taken from extensive testing of flat plate samples of various materials and the lowest values used in subsequent formulae. From tests carried out by WRC it was found that the shear bond strength at the interface was proportional to the compressive strength of the annular filling.





Although higher values of shear bond may be used it is prudent to use the lowest figure of shear bond of 0.68 MPa (98.62 PSI) when using grouts of between 9.5-12 MPa (1377.86- 1740.05 PSI) . 28 day compressive strength.

From the WRC design manual

Tensile capacity T_c limited by shear at the interface then becomes

$$T_c = (0.267 \times \text{Dia}) \times t = 0.267 \times \text{Dia}.$$

(in place of tensile stress of the material and derived from $n/8 \times 0.68 \text{ MPa (98.62 PSI)} \times D / t$)

Having established tensile capacity based on interface shear strength this can then be compared with the actual induced force F at the interface and in the lining due to loading, and a factor of safety established for the design.

i.e. Factor of Safety = Tensile Capacity T_c (WRc recommend a minimum factor of 2) induced force F

The maximum bending moment is at the crown where the lining is in tension and the old sewer is in compression.

Pin joints are assumed at the springing since no tensile capacity is taken to exist on the outer face of the sewer wall. It is therefore assumed that the tendency is for the crown to flatten and spread outward.

Bending moment coefficients are given in the manual for both no voids and suspect voids behind the brickwork.

In an over consolidated clay it may sometimes happen that horizontal pressure tends to force the springing inwards so the design case with the lining in tension is at the springing.

The basic principles of the WRC design are from standard engineering design references and can be applied to culverts outside the scope of the manual by using the shear calculation for specific curves and shear bond strengths.

The design for renovation of large culverts up to 5 meters diameter and outside the scope of the WRC manual have been carried out successfully using the basic engineering principles of the WRC manual by incorporating the shear stress equation for curved arch as the design limitation.

This method of design is recognized as being one of the most effective methods of renovation design, utilizing the existing structure.

Flat Top and Other Shapes

Structural designs calculations for flat top, box ovoid and horse shoe culverts and sewers can also be carried out using the bending moment coefficients listed in the WRC Rehabilitation manual and WRC 56E Report.

Flat top culverts were covered in the earlier WRC publication, 'Structural Design of Renovated Sewer Systems External Report 56E' Mich formed the basis for the current manual.

For calculation purposes based on the WRC method, it is assumed that the grout/concrete annulus filling around the periphery of the liner is of a constant thickness. It is therefore prudent to

assume that the existing culvert follows the same curvature and that the lever arm used to calculate the force in the liner is constant. In reality, for flat top sewers using curved soffit liners, the lever arm increases substantially as it moves away from the centre of soffit and the induced forces at the grout /panel interface reduce proportionally. The increase in lever arm is not assumed in the calculations. Although this may be considered an over design, it does allow the principles of the WRC design manual for a Type 1 design for curved arch liners to be used in flat top box culverts.

Description of Type II calculations and Tables

A Type II design examines the resistance to external hydraulic loading.

Most text books quote Timoshenko, Spangler and Von Mises for external loadings. Tables and charts have been drawn up to enable safe working head or critical buckling pressure to be obtained.

For Non-Circular Type II Liners, WRC use a derivative of the Timoshenko formulae, which examine both deflection and induced banding stress.





These are shown in the WRC manual as

Safe working external head limited by stress $H_1 = 340 \text{ SL}$ (T/1)2

SL is long term Flexural Stress

Safe working external head limited by stress..... $H_2 = R \cdot 236$ EL (t/1)3

EL is long term Flexural modulus.

R = 1 for curved (egg) form and .5 for flat sided culverts,

Factor of safety included in formulae is 2 plus 50 year value.

For Circular Type2 Liners, WRC give a table where safe working head based on pipe stiffness can be read off.

This table is based on the following formula from WRC 56E Report

Critical Buckling = $P_c = f_s \cdot f_a \cdot 2E / (1-v^2) (t/D)$ Pressure.

$P_c = (0.00981 h) \text{ in N/mm}^2$

f_s is the enhancement factor based on external support provided to the liner

(1 for unsupported and can be up to 10 for full support. Cured in place liners use a factor of 7).

f_a is correction factor for out of roundness read from graph. ($5\% = 0.7$ E is 50 year long term Flexural modulus in the radial direction. V is Poisson's ratio. (0.3 for **GRP**)

T is liner thickness Safe head = $P_c/2$ for a factor of safety of 2

D is liner diameter in mm

Therefore safe head = $-f_s \cdot f_a \cdot 2E \cdot 3 \cdot 1/0.00981 \text{ METERS} \dots 2 \cdot (1-v^2) \cdot (D)$

Transposing

Liner Thickness ($f_o f_s 50 \text{ years} + 2$) = $D \cdot 3 \cdot H \cdot (1-v^2) \cdot 0.00981 \cdot f_s \cdot f_a \cdot E$

Using the above formulae allows engineers to calculate safe head based on long term flexural modulus and stress, and thickness' for depths and diameters outside of the tables and charts currently available.

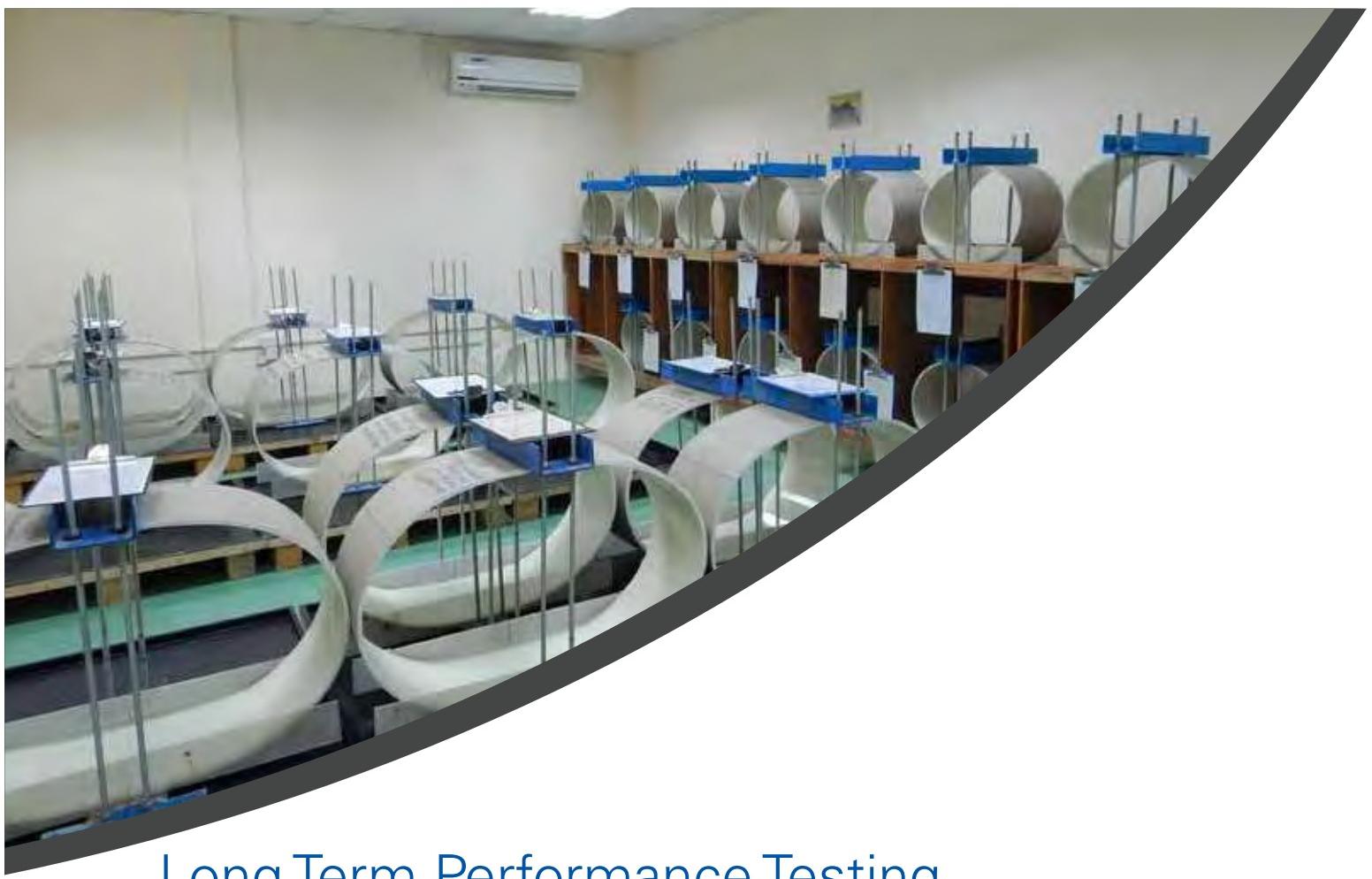
Chemical Resistance

The resin selection utilized for the construction of Channeline product will be determined in accordance with the service conditions and operating environment anticipated for the service life of the pipeline.

A full tabular listing of chemical reagents and environments, based on extensive laboratory tests and field service experience, is available on our website and as a separate document.

Prospective users of Channeline product are invited to consult the Channeline Technical Services Department for advice on specific exposure conditions and a full chemical resistance guide. Please contact the nearest Channeline Sales Office for further advice.





Long Term Performance Testing

Channeline products have been the subject of extensive long-term performance testing both in house and by many independent laboratories and test houses worldwide.

- These tests include:
- Ring stiffness tests
- Flexural modulus tests
- Flexural Creep tests
- Ageing tests under exposure to Sulfuric acid
- Leak tests, internal and external
- Wet abrasion tests
- Strain corrosion tests
- Chemical resistance

Testing procedure results are available for Channeline material in conformance with the following International Standards:

ASTM D 3262

Standard Specification
Fiberglass Sewer Pipes

BS 5480

Standard Specification for Reinforced Plastic (**GRP**) Pipes and Fittings for Water Supply and Sewerage

ASTM D638-96

Standard Test Method for Tensile Properties of Plastics

ASTM D790-96

Standard Test Method for Flexural Properties of Plastics

ASTM D2412-96

Standard Test Method for Stiffness by Parallel Plate Method

ASTM D2583-95

Standard Test Method for Indentation Hardness by Means of Barcol Impresser

ASTM D2584-94

Standard Test Method for Ignition Loss of Cured Reinforced Resins

ASTM D3681-96

Standard Method for determining chemical resistance of fiberglass pipe in deflection condition.

BS 2782 / ISO 527

Standard method for the Testing of Plastics.

WAA

Appendix A: Sewer lining dimensions and design method.

Appendix B: Methods of manufacture of **GRP** Sewer Liners.

Appendix C: Short Term and Long Term Flexural Modulus Methods.

Appendix D: Method of determining shear bond strength.

Appendix E: Method for the analysis of construction (loss of ignition).

Appendix F: Sampling Frequency for QC tests.

Quality Control and Testing

At Channeline, our overall policy is simple: Use the best people to engineer the best solutions and manufacture the best products to the highest standards and yet still continue to strive to improve in all that we do.

It goes without saying that with a quality policy this bold, we stand or fall by our performance. We therefore take all quality issues very seriously indeed.

Our manufacturing facility has been certified and operates to the requirements of ISO 9001 : 2015, ISO 14001 : 2015, ISO 45001 : 2018 Rigid in house quality control during manufacture is ingrained in our philosophy, which, together with strict inspection and testing regimes and the ability to coordinate with third party inspectors and external test houses, ensures we deliver on our quality pledge.

Daily and batch testing of each material production run is carried out by our QC department to verify conformity with the following project requirements:

Dimensional checks of wall thickness, I.D; O.D; Height and width.

- Bending and flexural
- Tensile tests
- Barcol Hardness
- Ring Stiffness Test
- Socket and Spigot fit
- Visual appearance

Certificates of Conformity are issued to each customer together with the test result handbook for each delivery shipped.





Proven Track-Record

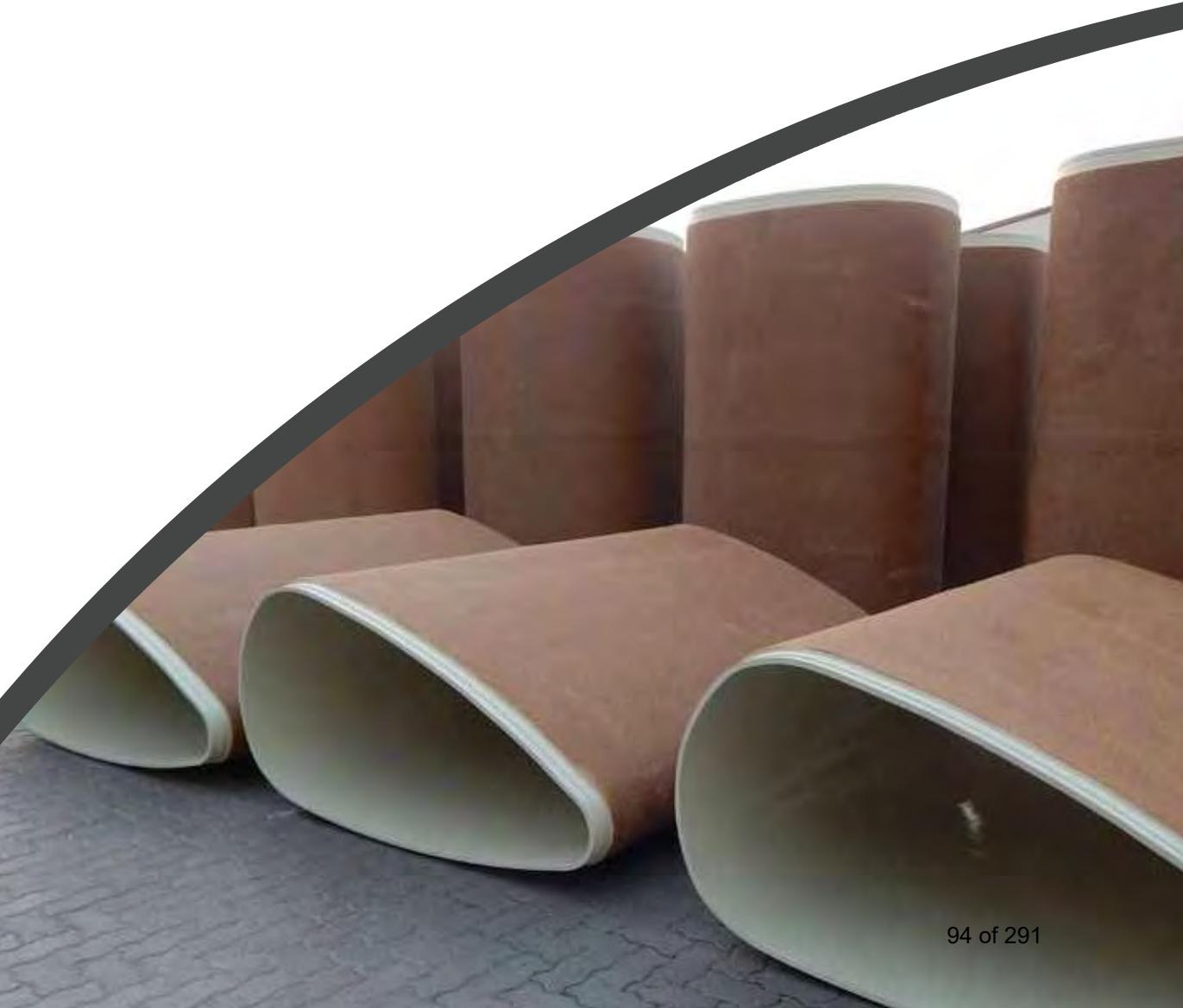
The Channeline **GRP** Structural Lining Systems have a proven track record for large diameter pipeline rehabilitation around the globe. Channeline products have been installed in projects in more than 30 countries worldwide.

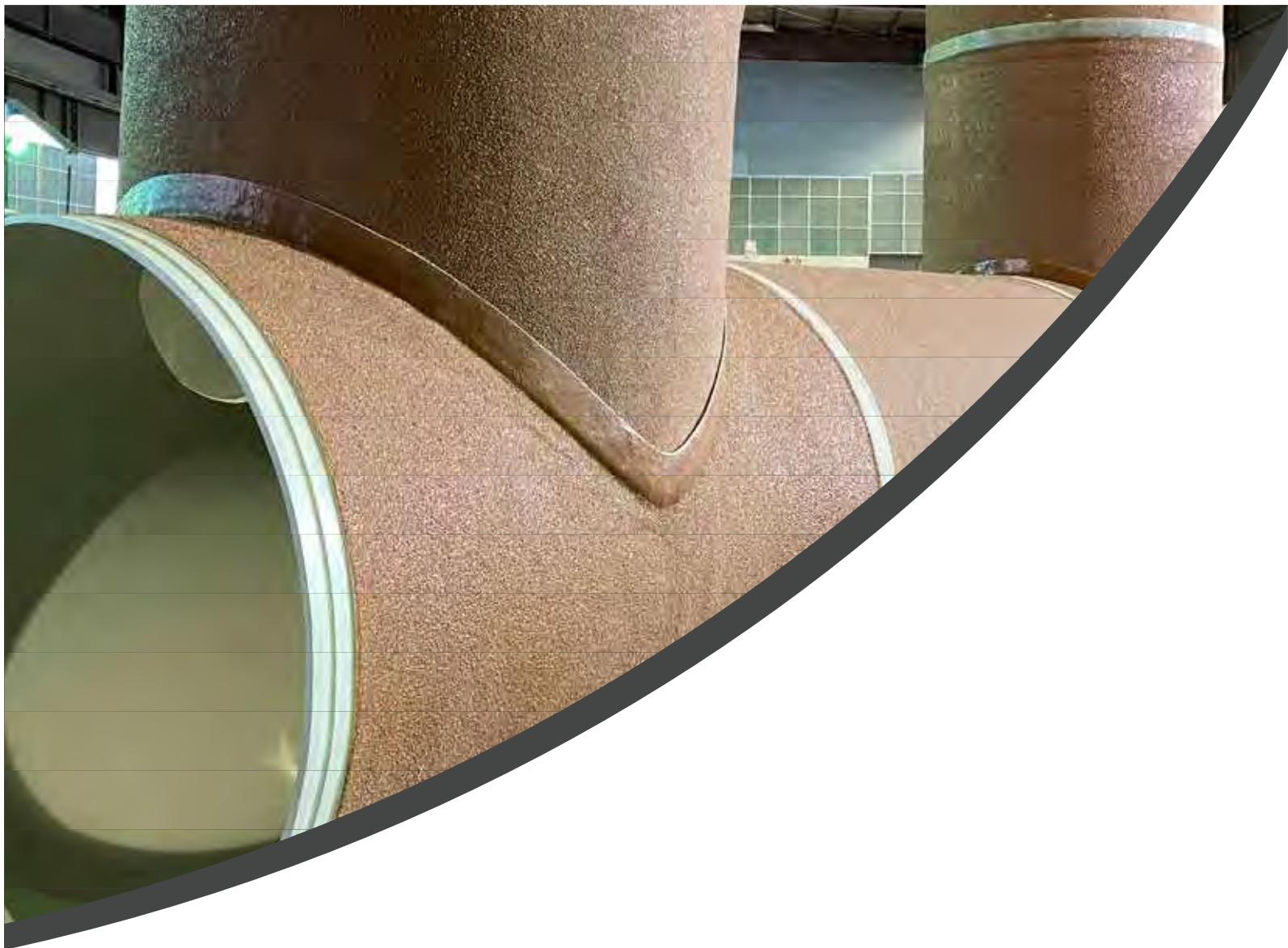
For a detailed project experience list, please contact our Channeline Representative Office, or visit our website: www.channeline-international.com

Worldwide Distribution Network

Channeline International is using licensed distributors to make our Channeline systems available throughout the world.

Channeline International brings unrivalled levels of innovation, experience and expertise in **GRP** Lining Systems technology. We have in-depth knowledge of the industry, our customers' day-to-day challenges and the environmental, health and safety standards in the marketplace. By working in close partnership with our customers, our company is able to provide timely, efficient, cost-effective and above all quality products and services.





CSTB (QB) Certification



Channeline manufactures products which are certified by CSTB and contain a QB mark which indicates the quality, performance and reliability of products and services of the company."

BENOR Certification

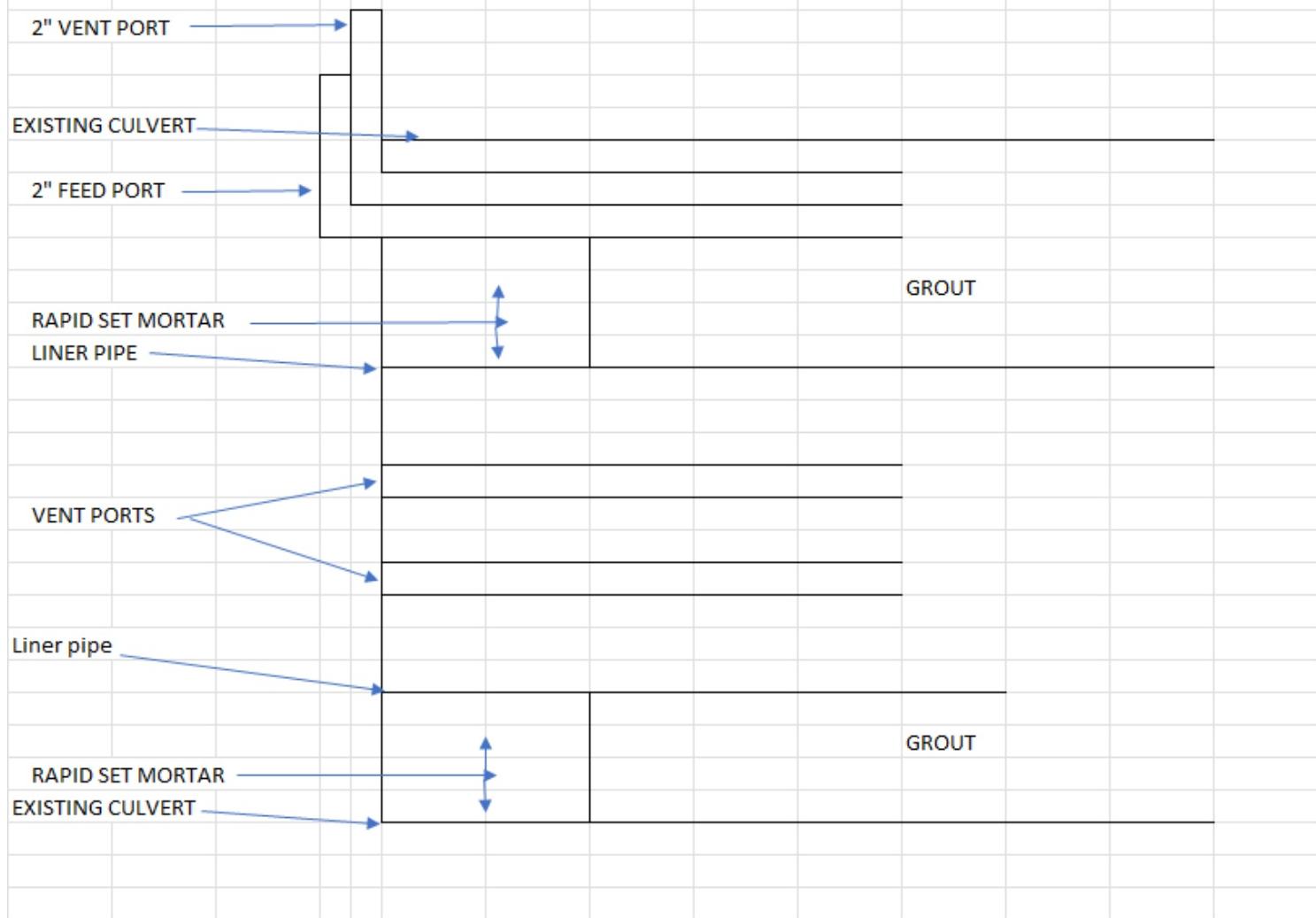


Channeline manufactures products which are BENOR certified.

These products contain the BENOR label which indicates that a product, process or service meets well-defined quality requirements.



BULKHEAD CONSTRUCTION



Previous projects Rapid Set Mortar Bulkhead photos:



MORTAR MIX

High-Strength Structural Repair Mortar

Rapid Set



PRODUCT DATASHEET

DESCRIPTION: Rapid Set® MORTAR MIX is a high-performance, fast-setting, multi-purpose repair material. Durable in wet environments, MORTAR MIX is a blend of Rapid Set hydraulic cement and quality aggregates. MORTAR MIX is non-metallic and no chlorides are added. Mix MORTAR MIX with water to produce a workable, high quality mortar material that is ideal where fast strength gain, high durability and low shrinkage are desired. MORTAR MIX sets in 15 minutes and achieves structural strength in 1 hour.*

USES: Use MORTAR MIX for general and structural concrete repair, construction of pavements, stucco and plaster repair, one-coat exterior plaster, underlays and formed work. MORTAR MIX is a versatile product that is suitable for vertical and overhead applications. In some geographical areas, Mortar Mix contains an air-entraining admixture for freeze-thaw durability.

ENVIRONMENTAL ADVANTAGES: Use MORTAR MIX to reduce your carbon footprint and lower your environmental impact. Production of Rapid Set cement emits far less CO₂ than portland cement. Contact your representative for LEED values and environmental information.

APPLICATION: Apply MORTAR MIX from 1/2" to 6" (1.2 cm to 15.2 cm) thick. For thicker applications, use Rapid Set® Concrete Mix. Not intended for extended exposure over 212°F (100°C). For overlay applications, a minimum of one test section should be prepared to evaluate the suitability of the materials and procedures.

SURFACE PREPARATION: For repairs, application surface must be clean, sound and free from any materials that may inhibit bond, such as oil, asphalt, curing compound, acid, dirt and loose debris. Roughen surface and remove all unsound material. Apply MORTAR MIX to a thoroughly saturated surface with no standing water.

MIXING: The use of a power-driven mechanical mixer, such as a mortar mixer or a drill-mounted mixer, is recommended. Organize work so that all personnel and equipment are in place before mixing. Use clean potable water. **MORTAR MIX may be mixed using 3 to 3.75 quarts (2.8 L to 3.5 L) of water per 55-lb (25-kg) bag for Department of Transportation projects and other critical applications. For general purpose applications, a maximum of 5 quarts (4.7 L) may be used. Use less water to achieve higher strengths.** For increased fluidity and workability, use Rapid Set® FLOW Control plasticizing admixture from the Rapid Set® Concrete Pharmacy®. Place the desired quantity of mix water into the mixing container. While the mixer is running, add MORTAR MIX. Mix for the minimum amount of time required to achieve a lump-free, uniform consistency (usually 1 to 3 minutes). Do not retemper.

PLACEMENT: MORTAR MIX may be placed using traditional construction methods. Organize work so that all personnel and equipment are ready before placement. Place, consolidate and screed quickly to allow for maximum finishing time. Use a method of consolidation that eliminates air voids. Do not wait for bleed water; apply final finish as soon as possible. MORTAR MIX may be troweled, floated or broom finished. On flat work, do not install in layers. Install full-depth sections and progress horizontally. To extend working time, use Rapid Set® SET Control retarding admixture from the Concrete Pharmacy or cold mix water. Do not install on frozen surfaces. MORTAR MIX may be applied in temperatures ranging from 45°F to 90°F (7°C to 32°C). Under dry ambient

OVERVIEW

Highlights:

Fast: Sets in 15 minutes, structural strength in 1 hour*

Durable: Formulated for long life in critical applications

Structural: For repair and new construction

Multi-purpose: Use for concrete repairs, wall repairs, stucco repairs, one-coat exterior plaster, underlays, floors, formed work, and more

Conforms to:

ASTM: C928 R3, C387

Approved:

State (DOT) and local approvals

MasterFormat® 2016

03 01 30	Maintenance of Cast-in-Place Concrete
03 01 40	Maintenance of Precast Concrete
03 01 50	Maintenance of Cast Decks & Underlayment
03 01 70	Maintenance of Mass Concrete
03 54 16	Hydraulic Cement Underlayment
04 01 00	Maintenance of Masonry
09 24 23	Cement Stucco

Manufacturer:

CTS Cement Manufacturing Corp.
12442 Knott St.
Garden Grove, CA 92841
Tel: 800-929-3030 | Fax: 714-379-8270
Web: www.CTScement.com
E-mail: info@CTScement.com



MORTAR MIX

High-Strength Structural Repair Mortar

conditions, water based coatings such as latex paint can be applied after 4 hours. Solvent based and impermeable coatings such as oil based paint and epoxy can be applied after 16 hours.

CURING: Water cure all MORTAR MIX installations by keeping exposed surfaces wet for a minimum of 1 hour. Begin curing after the material starts to harden and before the surface starts to lose its moist sheen. The objective of water curing is to maintain the moist sheen on the entire surface until the product has achieved sufficient strength. When experiencing extended setting time due to cold temperature or the use of retarder, longer curing times may be required.

COLD WEATHER: Environmental and material temperatures below 70°F (21°C) may delay setting time and reduce the rate of strength gain. Lower temperatures will have a more pronounced effect. Thinner sections will be more significantly affected. To compensate for cold temperatures, keep material warm, use heated mix water, and follow ACI 306 Procedures for Cold Weather Concreting.

WARM WEATHER: Environmental and material temperatures above 70°F (21°C) may speed setting time and increase the rate of strength gain. Higher temperatures will have a more pronounced effect. To compensate for warm temperatures, keep material cool, use chilled mix water, and follow ACI 305 Procedures for Hot Weather Concreting. The use of SET Control retarding admixture from the Concrete Pharmacy will help offset the effects of high temperatures.

YIELD & PACKAGING: MORTAR MIX is available in 55-lb and 25-lb (25-kg and 11.3-kg) sizes. One 55-lb (25-kg) bag of MORTAR MIX will yield approximately 0.5 ft³ (0.01 m³). One 25-lb (11.3-kg) box of MORTAR MIX will yield approximately 0.2 ft³ (0.006 m³).

SHELF LIFE: MORTAR MIX has a shelf life of 12 months when stored properly in a dry location, protected from moisture, out of direct sunlight, and in an undamaged package.

USER RESPONSIBILITY: Before using CTS products, read current technical data sheets, bulletins, product labels and safety data sheets. It is the user's responsibility to review instructions and warnings for any CTS products prior to use.

WARNING: DO NOT BREATHE DUST. AVOID CONTACT WITH SKIN AND EYES. Use material in well-ventilated areas only. Exposure to cement dust may irritate eyes, nose, throat, and the upper respiratory system/lungs. Silica exposure by inhalation may result in the development of lung injuries and pulmonary diseases, including silicosis and lung cancer. Seek medical treatment if you experience difficulty breathing while using this product. The use of a NIOSH/MSHA-approved respirator (P-, N- or R-95) is recommended to minimize inhalation of cement dust. Eat and drink only in dust-free areas to avoid ingesting cement dust. Skin contact with dry material or wet mixtures may result in bodily injury ranging from moderate irritation and thickening/cracking of skin to severe skin damage from chemical burns. If irritation or burning occurs, seek medical treatment. Protect eyes with goggles or safety glasses with side shields. Cover skin with protective clothing. Use chemical resistant gloves and waterproof boots. In case of skin contact with cement dust, immediately wash off dust with soap and water to avoid skin damage. In case of skin contact with wet cement, wash exposed skin areas with cold running water as soon as possible. In case of eye contact with cement dust, flush immediately and repeatedly with clean water, and consult a physician. If wet cement splashes into eyes, rinse eyes with clean water for at least 15 minutes and go to the hospital for further treatment.

Please refer to the SDS and www.CTScement.com for additional safety information regarding this material.

LIMITED WARRANTY: CTS CEMENT MANUFACTURING CORP. (CTS) warrants its materials to be of good quality and, at its option, will replace or refund the purchase price of any material proven to be defective within one (1) year from date of purchase. The above remedies shall be the limit of CTS' responsibility. Except for the foregoing, all warranties expressed or implied, including merchantability and fitness for a particular purpose, are excluded. CTS shall not be liable for any consequential, incidental, or special damages arising directly or indirectly from the use of the materials.

⚠ WARNING

CANCER and REPRODUCTIVE HARM - www.P65Warnings.ca.gov

TYPICAL PHYSICAL DATA

Set Time, ASTM C266

Initial set	15 minutes
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Final set	35 minutes
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Compressive Strength, ASTM C109 Mod.**

1 hour*	2500 psi (17.2 MPa)
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3 hours	4000 psi (27.6 MPa)
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24 hours	5000 psi (34.5 MPa)
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7 days	5500 psi (37.9 MPa)
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28 days	6500 psi (44.8 MPa)
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Slant Shear Bond Strength, ASTM C882 Mod. per C928

24 hours	1200 psi (8.27 MPa)
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28 days	2200 psi (15.2 MPa)
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Splitting Tensile, ASTM C496 Mod.**

7 days	450 psi (3.10 MPa)
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28 days	550 psi (3.79 MPa)
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Flexural Strength, ASTM C348 Mod.**

28 days	550 psi (3.79 MPa)
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Freeze Thaw, C666

Durability factor	95%
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Length Change, ASTM C157 Mod. per C928 (max)

28 days in air	-0.04
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28 days in water	0.02
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*After final set

**Data obtained at flow consistency 100 by ASTM C1437
at 70°F (21°C)





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E-mail: sales@channeline-international.com
Website: www.channeline-international.com

CHANNELINE 
Beyond the Ordinary

100 of 291

AERLITE™ AERLITE-iX™

Our AERLITE™ family of products produces the most advanced stable performed foam, allowing for major advancements in the application of cellular concrete.

AERLITE™ & AERLITE-iX™ Produced Cellular Concrete Features & Benefits

- ▲ Lightweight
- ▲ Insulating; freeze thaw resistant
- ▲ High Slump; virtually self leveling
- ▲ Rapid Installation by pump or gravity
- ▲ Load reducing engineered fill
- ▲ Absorbs shock waves
- ▲ Broad spectrum of densities and compressive strengths
- ▲ Low water absorption and low permeability
- ▲ Reduces hydrostatic pressure on retaining walls

The AERLITE™ family of products produces cellular concretes that comply with the standard specifications of ASTM C 869 when tested in accordance with ASTM C 796

CB: Product data for Cellular Concrete CELLULAR CONCRETE FOR GEOTECH APPLICATIONS



Cellular lightweight concrete (CLWC) is used to solve a wide variety of challenges in the geotechnical construction and mining industries. CLWC is an engineered fill material containing uniformly distributed air voids generated by mixing a cement slurry with a stable preformed foam. In its rigid form, it can be thought of as concrete having air as the aggregate.

Aerix Industries™ engineers and manufactures a dynamic product line of foam liquid concentrates that produces the most advanced preformed foam in the industry. The AERLITE™ family of hybrid and synthetic foaming agents produce a closed-cell, non permeable lightweight concrete, when combined with a cement slurry.

CLWC produced using the AERLITE™ family of products, can be engineered with wet cast densities ranging from 20 to 120 pcf and compressive strengths of 20 to 3000 psi.

Multiple production methods and engineered material properties create a diverse index of practical CLWC applications. The ability to precisely control density, slump, and strength position CLWC as an ideal alternative to traditional fill methods in many construction applications.

Aerix Industries™
Advanced Engineered Foam Solutions



AERLITE™ AERLITE-iX™

Our AERLITE™ family of products can be engineered to produce CLWC of specific densities, strengths, and slumps providing solutions to a wide range of geotechnical construction challenges



AERLITE™ & AERLITE-iX™ Geotechnical Applications

- ▲ Virtually Self-Leveling Fill
- ▲ Tunnel Backfill
- ▲ Underground Tanks and Pipelines
- ▲ Soil Stabilization
- ▲ Annular Grouting / Backfill
- ▲ Load-Reducing Engineered Fill
- ▲ Pipeline Beds
- ▲ Fill for Abandoned Mines
- ▲ Impact Absorption
- ▲ Bridge Approach & Landslip Repair
- ▲ Retaining Wall Backfill
- ▲ Tremie Applications

CB: Product data for Cellular Concrete CELLULAR CONCRETE FOR GEOTECH APPLICATIONS

CLWC engineered fill has a long track record of success providing value-engineered solutions when granular fills or lightweight aggregate material options are too heavy, site access is limited, or project schedules are tight. CLWC material is highly flowable and easily placed, does not require pre-loading for settlement mitigation, and provides a 2 to 1 point-load distribution edge. The fluid material will completely fill annular spaces and exhibits shrinkage of less than 0.3%. CLWC produced with the AERLITE™ family of products is environmentally safe and cost competitive.



ADVANCEMENTS IN CLWC TECHNOLOGY

The Aerix™ team is continually working to make advancements in CLWC technology. The ability to engineer the material to specific densities, compressive strengths and slumps has enabled us to customize the performance of our products to meet project specific requirements. Typical foams produce CLWC with an 8-9 inch slump which can be placed in 3 foot lifts and pumped a maximum of 5,000 feet. Our advanced engineered foam technology has allowed our technical team to engineer material with a 2-9 inch slump range, increasing lift thickness to 8-20 feet and increasing pumping distance to over 15,000 feet. Our advanced hybrid and synthetic foaming agents increase the stability of the bubble, allow for higher flyash usage and are continuing to advance the CLWC industry.

Aerix Industries™
Advanced Engineered Foam Solutions



CB: Cellular Concrete Plan and Procedure

Generic Grouting Plan and Method Statement for Annulus Filling of the Channeline GRP Structural Lining System using Low Density Cellular Grout.

Scope of Work.

The scope of work is detailed in the Contract Specifications.

The annulus grouting will be undertaken in three lifts (minimum) to accommodate annulus dimensions and volumes

Site Conditions.

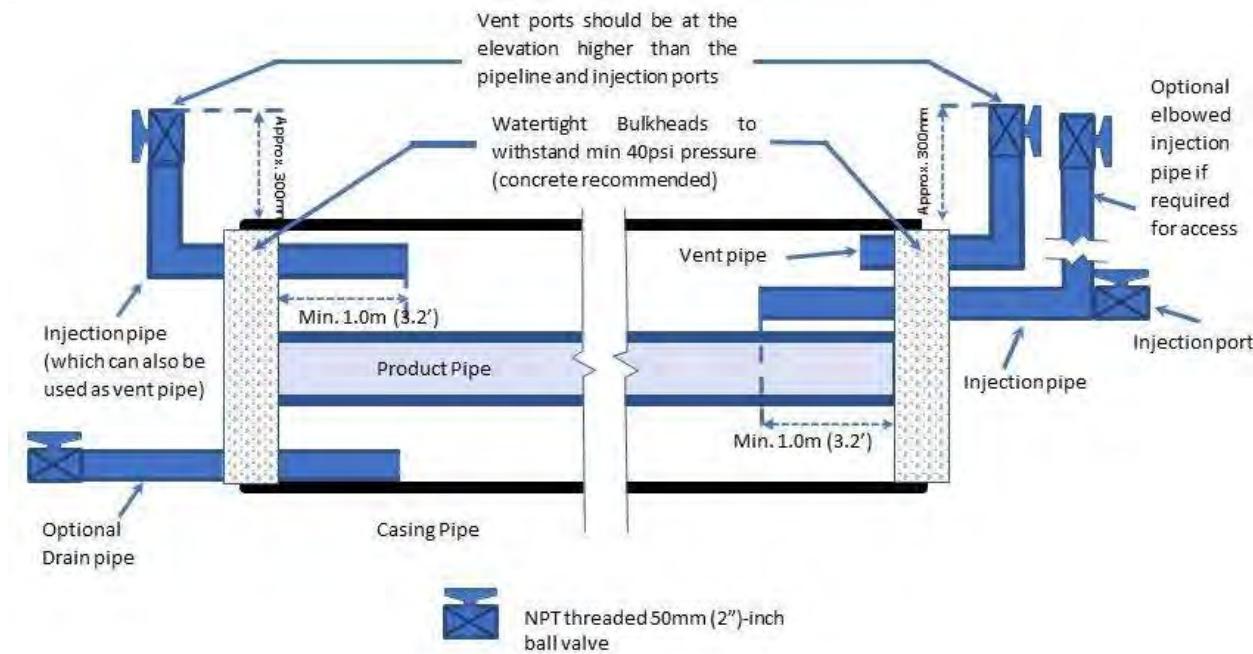
- This grouting plan is based upon the grouting equipment being installed at one location and supplying grout through the installed liner using 50mm (2") grout hoses and Pre-installed Grout Lines affixed to the obvert of the host pipe at predetermined termination points along the annulus

Grout Connections:

- The 50mm (2"-inch) injection pipes (rated to >100psi) should be set into the pipe interior at either one or both ends of the section to be grouted. The injection pipes should be set through the bulkhead to minimum 1 meter inside the pipe. The injection port should be easily accessible to Injection Contractors pumping hose. The injection port should consist of male or female NPT threads and a full port ball valve (i.e., a quick means of isolation).
- Vent pipes should be 25 to 75mm (i.e., 1 to 3 inches) in diameter. The purpose of this pipe is to allow for air evacuation. These pipes should be equipped with valves on the ends and located at the elevation higher than the pipeline and injection ports.



GROUTING SITE PREPARATION REQUIREMENTS



Notes: 1. The sketch is prepared for an annular grout with a GRP product pipe.

2. The pipe to be grouted must be free of standing liquids and debris.
3. The 50mm (2"-inch) injection pipes (rated to >100psi) should be set through the bulkhead to minimum 1 meter (3.2') inside the pipe.
4. The bulkhead must be watertight and able to withstand minimum 40psi pressure.

Bulkheads:

- Provide bulkheads or closures at the pipe ends. The bulkhead must be watertight and able to withstand minimum 40psi pressure. Channeline recommends using Portland Cement based concrete or concrete bricks and mortar for these bulkheads. Where concrete is not practical, the bulkhead must be constructed in way so that it is watertight and able to withstand minimum 40psi pressure. Care must be taken to prevent blocking the injection pipe with the bulkhead construction.

Blocking:

- The Sliplining Pipe should be secured against movement or floatation. This can be achieved by installing wooden or mechanical blocking at pre-determined areas or where impractical, by filling the liner with water.



CB: Cellular Concrete Plan and Procedure

Grouting Equipment:

Grouting Equipment will consist of (but not limited to) the following items:

- Size 4-6 Progressive Cavity Grout Pump, capable of delivering between 8 – 25 GPM of grout
 - 50mm (2") Grout Delivery Hoses rated to 500psi, Camlock Fittings
 - Grout Valves and connectors equipped with Camlock Fittings
 - Pressure Gauges
 - Flow Monitor
 - Quality Control testing and measuring equipment

Grout Formulation:

Grout Strength will be a minimum of 2mpa (290psi) or as specified in the contract documents.

Sample Mix Design.

Flowable Self-Compacting Cementitious Cellular Concrete Grout shall have a wet-cast (placed) density of 950 kg/m³ (+/-10%)(194 psf), and a minimum unconfined compressive strength of 2 MPa at 28 days. The material is produced on site by mixing preformed foam into a cement slurry to reach the target placed density of 950 kg/m³. The cement slurry should be produced using an 80GU/20Fly Ash blend, mixed with water. Sand or any other aggregates are not included within the slurry mix design.

Disclaimer: The above Mix Design is a recommendation only, it is the contractors responsibility to perform cylinder testing, prior to placement, to confirm that said mix design offers the appropriate 28 day compressive strength, As such, the owner agrees to indemnify and hold Channeline International harmless from and against any loss, liability, damage, claim, cost and expense (including legal fees) however arising, out of any non-performance of the Concrete/Grout as recommended.

I. Testing and Quality Control

Test Cylinders will be cast as the grouting work proceeds for compressive strength testing per the contract specifications.

While grouting operations are underway, density tests will be conducted on each batch to monitor and maintain quality control.

Grouting Procedure

- Grouting operation will commence from the downstream end of the lining and progress upstream as pre-determined volumes of grout are dispensed.



CB: Cellular Concrete Plan and Procedure

- The pre-mixed grout will be discharged via the Ready-mix truck chute into the Grout Plant Hopper. Mesh screens will be positioned in the chute to ensure that larger aggregate or lumps are removed from the grout.
- Cellular Foaming Agent can be introduced at the ReadyMix Truck or inline.
- Grout levels in the annulus can be checked by lightly tapping (sounding) the GRP liner surface. Following the initial set the grouted sections produce a distinctive tone when tapped. (Note: The Water Research Centre Sewerage Rehabilitation Manual states that up to 20% of voids in the grouted annulus are acceptable).
- At all times during the grouting operations, spilled grout debris/water should be cleaned from the inner surface of the GRP liner.
- Following the completion of each grout list the Injection Port ball valve should be opened and cleaned ready for further use.
- Repeat the process until the annular space is filled to an acceptable level. Close all grout nipple ball valves until the initial set of the grout is complete (approx 8 hours).
- The sequence of grouting lifts and the number and location of the grout/vent/drain holes, can be adjusted as approved by the Channeline Installation Supervisor and or Professional Grouting Engineer.

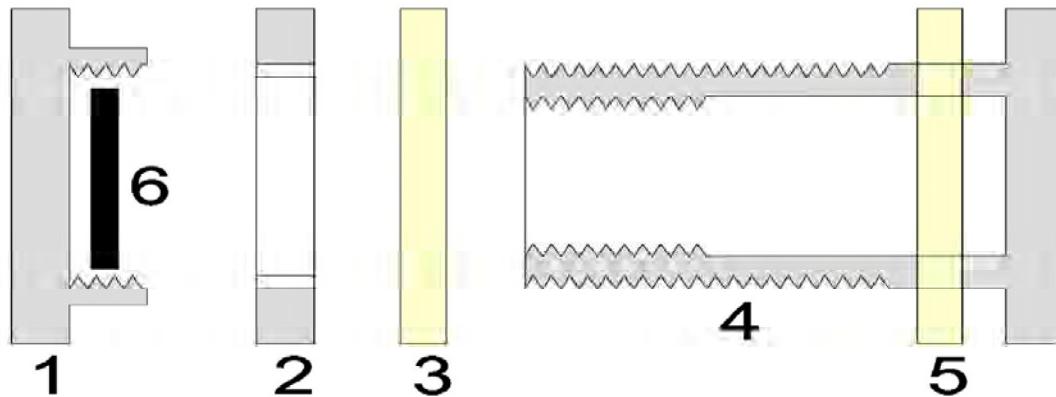


CB: Cellular Concrete Plan and Procedure

Method Statement for Grout Plug Installation

1. Components:

Below shown is a representation of the components in the grout plug.



1. End Cap – Should be fixed from inside of pipe after grouting operation.
2. Tightening Nut – to be tightened to the threaded shaft from inner side of panel
3. Rubber Washer
4. Threaded Shaft – this has an internal NPT thread which when installed should at the inner Side of panel.
5. Rubber Washer
6. Rubber Washer for End cap – Flat/solid



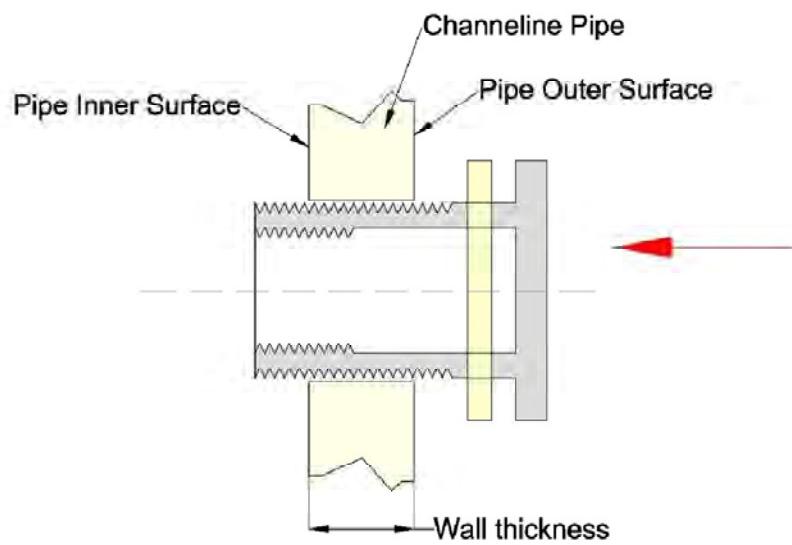
CB: Cellular Concrete Plan and Procedure

2. Assembly :

1. Bring/Rotate the pipe to a position where the grout plugs can be comfortably fixed as seen below,



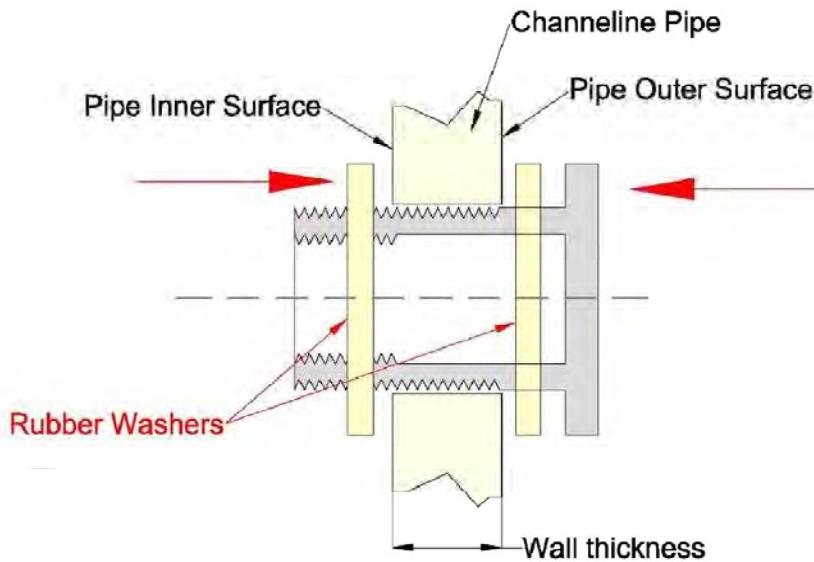
2. Insert the threaded shaft including a rubber washer from outside surface through the pre-drilled hole keeping the inner threaded portion of shaft at the inside of pipe.



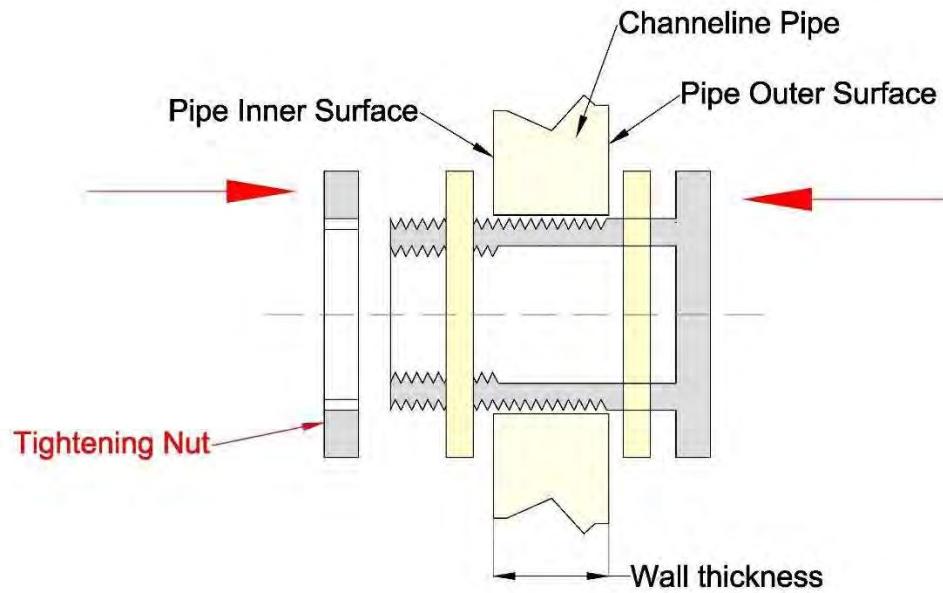


CB: Grouting Plan and Procedure

3. Insert the rubber washers from either side of the threaded shaft,



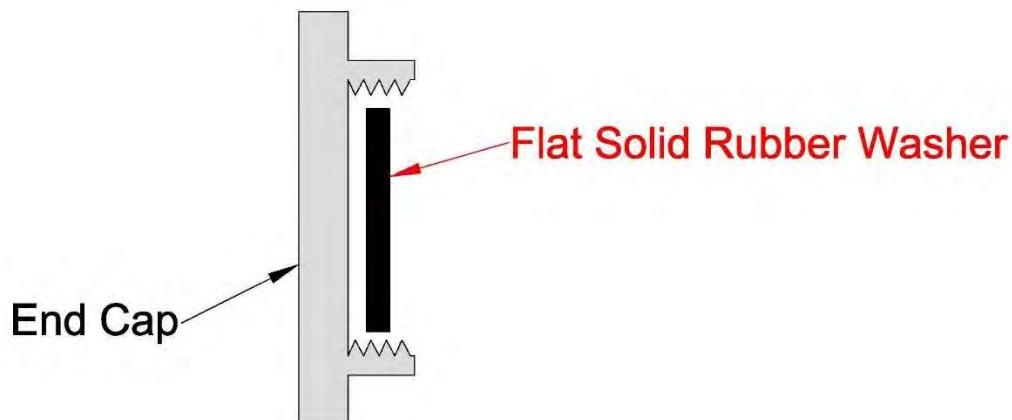
4. Tighten the nut to the threaded shaft using the provided or similar wrench.



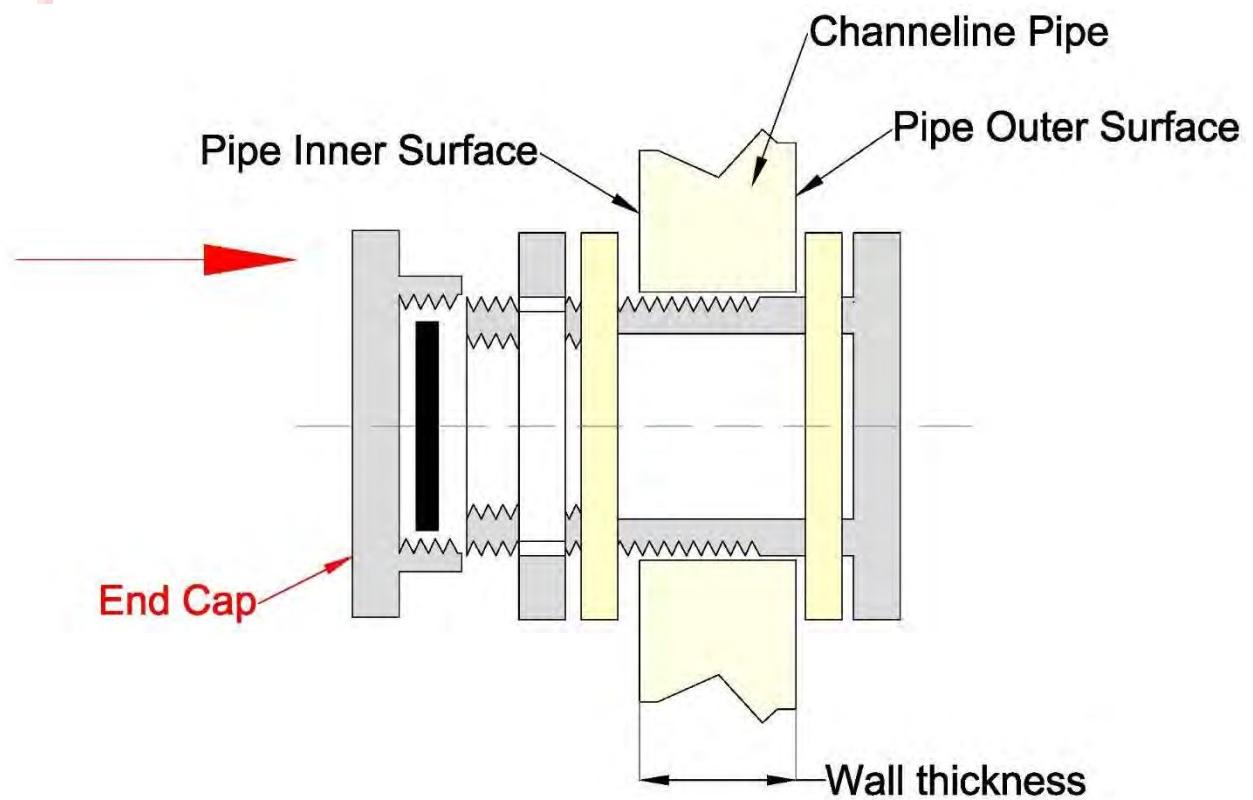


CB: Cellular Concrete Plan and Procedure

5. Place the flat rubber washer inside the End Cap.



6. Tighten the End Cap to the threaded shaft after grouting operation.



CB: Gasket Installation Plan and Procedure - per meeting held on 10/27 with Commodore, W&S, and CLH&Sons the gasket is the desired joint detail in lieu of the Sikaflex sealant.

METHOD STATEMENT

FOR APPLICATION OF GASKET INSTALLATION PROCEDURE

DOCUMENT : CNL/GIP/2022/01

Prepared by:



Devanand Chelot

QA/QC Manager & QMR

Date: 17.10.2022

Reviewed by:



Blessen Bovas

Divisional Manager

Date: 17.10.2022

Approved by:



Timothy Webb

Senior Vice President

Date: 17.10.2022

Revision No.	Date	Remarks
0	17.10.2022	Issued for Approval

METHOD STATEMENT FOR APPLICATION OF GASKET INSTALLATION PROCEDURE

- 1) Prepare the groove by cleaning the gasket seating area using a cloth.
- 2) Using a brush, apply Tylox gasket adhesive/glue on the groove where the gasket needs to be seated as shown in figure 1.



Figure 1

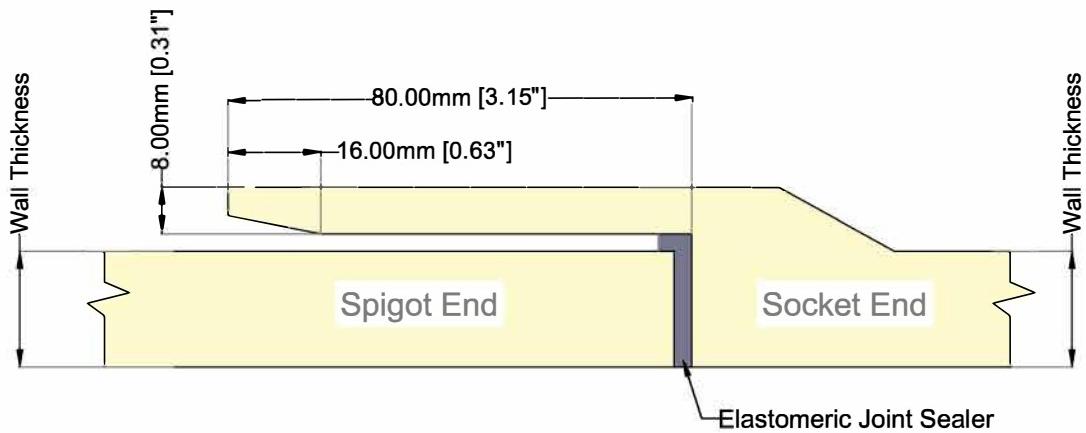
- 3) Place the gasket on the groove such that the flat side of the gasket rests on the groove and the grip side faces the top as shown in figure 2.



Figure 2

CB: Gasket Installation Plan and Procedure

- 4) Allow to cure. The curing time for the gasket glue is less than 20 minutes at a temperature of 25 deg C.
- 5) Apply grease on the entire spigot and inside the socket area and push the pipes together.
- 6) Ensure that there are no gaps above 5mm between the spigot and socket.

**Notes:**

1. THE ENTIRE DEPTH OF THE SOCKET AND SPIGOT JOINT SHALL BE FILLED WITH ELASTOMERIC JOINT SEALER , SUCH AS SIKAFLEX 1A OR APPROVED EQUAL.
 2. SURFACE PREPARATION
CLEAN ALL SURFACES. SURFACE MUST BE SOUND, CLEAN, DRY, FROST-FREE, AND FREE OF OIL AND GREASE. RESIDUES AND ANY OTHER FOREIGN MATTER MUST BE THOROUGHLY REMOVED.
 3. APPLICATION METHOD / TOOLS
THE RECOMMENDED APPLICATION TEMPERATURE FOR ELASTOMERIC JOINT SEALER IS BETWEEN 40°F (4°C) AND 100°F (38°C). FOR COLD WEATHER APPLICATIONS, CONDITION CARTRIDGES AT APPROXIMATELY 70°F (21°C) AND MAINTAIN THAT TEMPERATURE UNTIL PRIOR TO USE.
 4. DO NOT APPLY OVER DAMP SURFACES AT THIS WILL AFFECT ADHESION AND MAY BE LEAD TO BUBBLING WITHIN THE SEALANT.
 5. USE WITH ADEQUATE VENTILATION. ELASTOMERIC JOINT SEALER IS EASY TO APPLY WITH CONVENTIONAL CAULKING EQUIPMENT , IT IS RECOMMENDED THAT A MECHANICAL APPLICATION GUN IS USED TO APPLY THE SEALANT, PNEUMATIC OR BATTERY POWERED
 6. AVOID AIR ENTRAPMENT WHEN APPLYING SEALANT
 7. AVOID CONTACT WITH ALCOHOL AND OTHER SOLVENT CLEANERS DURING CURE.
 8. ALLOW SEALANT TO CURE FULLY PRIOR TO GROUTING THE CHANNELINE GRP LINING SYSTEM
- CURING RATE:
 TACK-FREE TIME : 4 HOURS
 TACK-FREE TO TOUCH : 3 HOURS
 FINAL CURE : 1 TO 7 DAYS (DEPENDING ON JOINT THICKNESS)

*Result may differ based upon statistical variations depending upon mixing methods and equipment, temperature, application methods, test methods, actual site conditions and curing conditions.

ISSUED BY: TIM WEBB	Typical Socket & Spigot Joint for Channeline International GRP Structural Rehabilitation System		
REVIEWED BY: BB			
SCALE: N.T.S	CHANNELINE INTERNATIONAL GRP Structural Lining Systems	DRAWING NO. CH/1807/NY/1PB/JD01	REV. 0
DATE: 05 APR. 23			114 of 291

CB: Sikaflex Installation Plan and Procedure

DO NOT ALLOW A JOINT TO LOOK LIKE THIS BEFORE PERFORMING GROUT PROCEDURES



THIS IS WHAT YOUR JOINTS SHOULD LOOK LIKE:



APPENDIX C



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
091-0326
MassDEP File #

eDEP Transaction #
Arlington
City/Town

A. General Information

Please note:
this form has
been modified
with added
space to
accommodate
the Registry
of Deeds
Requirements

Important:
When filling
out forms on
the
computer,
use only the
tab key to
move your
cursor - do
not use the
return key.

1. From: Arlington
Conservation Commission
2. This issuance is for
(check one): Order of Conditions Amended Order of Conditions
3. To: Applicant:

<u>Mike</u>	<u>Rademacher</u>
a. First Name	b. Last Name
<u>Town of Arlington Department of Public Works</u>	
c. Organization	
<u>51 Grove Street</u>	
d. Mailing Address	
<u>Arlington</u>	<u>MA</u>
e. City/Town	f. State
<u>02476</u>	
g. Zip Code	

4. Property Owner (if different from applicant):

 tab	a. First Name	b. Last Name
 return	c. Organization	
	d. Mailing Address	
	e. City/Town	f. State
	g. Zip Code	

5. Project Location:

<u>51 Grove Street</u>	<u>Arlington</u>
a. Street Address	b. City/Town
<u>54-3-2.A</u>	
c. Assessors Map/Plat Number	d. Parcel/Lot Number
<u>Latitude and Longitude, if known:</u>	<u>42d25m10.953s</u>
	d. Latitude
	<u>71d9m49.85s</u>
	e. Longitude



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

091-0326

MassDEP File #

eDEP Transaction #

Arlington

City/Town

A. General Information (cont.)

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):

Middlesex South

a. County

9705

c. Book

b. Certificate Number (if registered land)

6

d. Page

7. Dates: a. Date Notice of Intent Filed b. Date Public Hearing Closed c. Date of Issuance

8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):

See attached findings and special conditions

a. Plan Title

b. Prepared By

c. Signed and Stamped by

d. Final Revision Date

e. Scale

f. Additional Plan or Document Title

g. Date

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:

- a. Public Water Supply b. Land Containing Shellfish c. Prevention of Pollution
d. Private Water Supply e. Fisheries f. Protection of Wildlife Habitat
g. Groundwater Supply h. Storm Damage Prevention i. Flood Control

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

Approved subject to:

- a. the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
091-0326
MassDEP File #

eDEP Transaction #
Arlington
City/Town

B. Findings (cont.)

Denied because:

- b. the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**
- c. the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**
3. Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) a. linear feet

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. <input type="checkbox"/> Bank	a. linear feet	b. linear feet	c. linear feet	d. linear feet
5. <input type="checkbox"/> Bordering Vegetated Wetland	a. square feet	b. square feet	c. square feet	d. square feet
6. <input type="checkbox"/> Land Under Waterbodies and Waterways	a. square feet	b. square feet	c. square feet	d. square feet
7. <input checked="" type="checkbox"/> Bordering Land Subject to Flooding	e. c/y dredged 3,725 a. square feet 0 e. cubic feet	f. c/y dredged 3,725 b. square feet 0 f. cubic feet	3,725 c. square feet 0 g. cubic feet	3,725 d. square feet h. cubic feet
Cubic Feet Flood Storage				
8. <input type="checkbox"/> Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. <input checked="" type="checkbox"/> Riverfront Area	30,417 a. total sq. feet 16,973 c. square feet 13,444 g. square feet	30,417 b. total sq. feet 16,973 d. square feet 13,444 h. square feet		
Sq ft within 100 ft			e. square feet	f. square feet
Sq ft between 100-200 ft			i. square feet	j. square feet



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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091-0326

MassDEP File #

eDEP Transaction #

Arlington

City/Town

B. Findings (cont.)

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. <input type="checkbox"/> Land Under the Ocean	a. square feet	b. square feet	c. c/y dredged	d. c/y dredged
12. <input type="checkbox"/> Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. <input type="checkbox"/> Coastal Beaches	a. square feet	b. square feet	c. cu yd	d. cu yd
14. <input type="checkbox"/> Coastal Dunes	a. square feet	b. square feet	c. cu yd	d. cu yd
15. <input type="checkbox"/> Coastal Banks	a. linear feet	b. linear feet		
16. <input type="checkbox"/> Rocky Intertidal Shores	a. square feet	b. square feet		
17. <input type="checkbox"/> Salt Marshes	a. square feet	b. square feet	c. square feet	d. square feet
18. <input type="checkbox"/> Land Under Salt Ponds	a. square feet	b. square feet		
19. <input type="checkbox"/> Land Containing Shellfish	c. c/y dredged	d. c/y dredged		
20. <input type="checkbox"/> Fish Runs	a. square feet	b. square feet	c. square feet	d. square feet
21. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	a. c/y dredged	b. c/y dredged		
	a. square feet	b. square feet		
22. <input type="checkbox"/> Riverfront Area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
091-0326
MassDEP File #

eDEP Transaction #
Arlington
City/Town

B. Findings (cont.)

* #23. If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c (BVW) or B.17.c (Salt Marsh) above, please enter the additional amount here.

23. Restoration/Enhancement *:

a. square feet of BVW

b. square feet of salt marsh

24. Stream Crossing(s):

a. number of new stream crossings

b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects.

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
 - a. The work is a maintenance dredging project as provided for in the Act; or
 - b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
 - c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on 12/23/2023 unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
091-0326
MassDEP File #

eDEP Transaction #
Arlington
City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act

8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.
9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.
10. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,

"Massachusetts Department of Environmental Protection" [or, "MassDEP"]

"File Number 091-0326"

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
091-0326
MassDEP File #

eDEP Transaction #
Arlington
City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.
19. The work associated with this Order (the "Project")
(1) is subject to the Massachusetts Stormwater Standards
(2) is NOT subject to the Massachusetts Stormwater Standards

If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:

- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.
- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:
 - i. all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;
 - ii. as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;
 - iii. any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

091-0326

MassDEP File #

eDEP Transaction #

Arlington

City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

- iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;
 - v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.
- c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following:
- i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and
 - ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.
- d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.
- e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.
- f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

091-0326

MassDEP File #

eDEP Transaction #

Arlington

City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

- g) The responsible party shall:
 1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
 2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
 3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.
 - h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.
 - i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
 - j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
 - k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
 - l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

See attached findings and special conditions

20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

091-0326

MassDEP File #

eDEP Transaction #

Arlington

City/Town

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? Yes No
2. The Arlington Conservation Commission hereby finds (check one that applies):
 - a. that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:
1. Municipal Ordinance or Bylaw 2. Citation
Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.
 - b. that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:
Arlington Bylaw for Wetlands Protection Title V, Art 8
1. Municipal Ordinance or Bylaw 2. Citation
3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.
The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):
See attached findings and special conditions



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
091-0326
MassDEP File #

eDEP Transaction #

City/Town

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

12/23/2020

1. Date of Issuance

Please indicate the number of members who will sign this form.

4

This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

Signature

Printed Name

Susan Chapnick

Signature

Printed Name

Charles Irone

Signature

Printed Name

Pam Heidell

Signature

Printed Name

David Kaplan

Signature

Printed Name

Signature

Printed Name

Signature

Printed Name

Signature

Printed Name

by hand delivery on

by certified mail, return receipt requested, on

Date

12/23/2020

Date



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

091-0326

MassDEP File #

eDEP Transaction #

Arlington

City/Town

G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Arlington

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Arlington

Conservation Commission

Please be advised that the Order of Conditions for the Project at:

51 Grove Street

Project Location

091-0326

MassDEP File Number

Has been recorded at the Registry of Deeds of:

Middlesex South

County

9705

Book

6

Page

for: Town of Arlington
Property Owner

and has been noted in the chain of title of the affected property in:

Book

Page

In accordance with the Order of Conditions issued on:

12/23/2020

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant

DOCUMENTS REVIEWED

1. Department of Public Works (DPW) Facility Notice of Intent, Arlington, MA, prepared by Weston & Sampson, for the Applicant: Town of Arlington, Michael Rademacher, dated October 22, 2020. Appendices include: (A) Project Description, (B) Alternatives Analysis, (C) Stormwater Report, (D) Project Maps, (E) Project Specifications, (F) Abutters Information, and (G) Photos.
2. Arlington Town Yard Facility, 51 Grove Street Arlington MA NOI Permit Plan Set, prepared by Weston & Sampson, stamped by Laurence F Keegan Jr PE #33708, dated October 21, 2020.
3. Arlington DPW Facility NOI Filing Supplemental Information, prepared by Weston & Sampson, dated November 24, 2020. Attachments include: (1) revised plan sheets C401 (Layout and Materials Plan) and C603 (Grading and Drainage Plan East), (2) Pre vs Post Flows Spreadsheet for NOAA + rainfall, (3) Pre vs Post Flows Spreadsheet for NOAA ++ rainfall, (4) Existing HydroCAD analysis for NOAA++ rainfall, (5) Proposed Existing HydroCAD analysis for NOAA++ rainfall, (6) Specification 01570 Environmental Protection, and (7) Specification 31 12 00.13 Invasive Species.

PUBLIC COMMENTS

4. Email from Sarah Tuttle, dated November 5, 2020.

PROCEEDINGS

The Notice of Intent was filed on October 26, 2020. The Conservation Commission opened the public hearing for the Notice of Intent on November 5, 2020. The hearing was continued with the Applicant's consent to December 3, 2020. The Commission closed the public hearing on December 3, 2020. The Commission deliberated on December 17, 2020 and voted 6-0 to approve the Project with conditions under the Wetlands Protection Act (the "Act") and voted 6-0 to approve the Project with conditions under the Arlington Wetlands Protection Bylaw (the "Bylaw").

**FINDINGS OF FACT AND LAW
UNDER ARLINGTON WETLANDS PROTECTION BYLAW
AND WETLANDS PROTECTION ACT**

- A. This project proposes a new/renovated Municipal Facility to support the Department of Public Works (DPW), Inspectional Services Department (ISD), Facilities, and IT departments at 51 Grove Street. The proposed site includes the current 4.4-acre parcel, used by DPW/ISD, and an adjacent 1.4-acre portion of Town-owned land for a total of 5.8 acres. Sections of the site are within the 100-ft Wetlands Buffer, AURA, and 200-ft Riverfront Area of Mill Brook, as well as floodway and floodplain. The project also involves mitigation including invasive plant removal and native replanting, landscaping, seven rain gardens/bio-filtration landscaped areas, and a new stormwater system with stormwater quality units.
- B. The Project site is located on Grove Street, immediately northwest of the High School. It is bound easterly by a National Grid natural gas facility and the Minuteman Bikeway. Westerly of the property are residences and a grocery store. North of the property, across Grove Street, are residences and Wellington Park. There are six existing buildings on the Public Works site. The Public Works property is approximately 5.8 acres and is predominately paved. The area that is currently being used as a field to the southwest of the buildings, is constructed over an area of contaminated soil and has an impermeable cap just beneath the surface, essentially rendering the field area impervious as well. Site grades are generally flat but there are sections of higher elevations sloping away from Mill Brook.

ARLINGTON CONSERVATION COMMISSION

APPROVAL ORDER OF CONDITIONS 51 Grove Street, DPW Renovation DEP FILE NO. 091-0326

Running north to south through the property is Mill Brook. From the property line at Grove Street, the Brook runs in a stone lined channel for approximately 37 feet, before entering a culvert. This channel is a regulatory floodway per FEMA mapping. From the end of the stone channel, the Brook enters a culvert. The culvert daylights at two locations on the property. Each of these openings and the area surrounding them are part of the 200-foot Riverfront Area and 100-year flood zone per FEMA mapping.

- C. The following Resource Areas are present on the site or within 100 feet of the project area: Bordering Land Subject to Flooding, Adjacent Upland Resource Area, Buffer Zone, and Riverfront Area. The Commission finds accurate the delineation of Resource Areas shown on the approved Site Plans.
- D. The Commission approves those portions of the overall project that are within conservation jurisdiction as shown on the referenced plans (reviewed document #2 and #3).

CONCLUSION

Based on the testimony at the public hearings, and review of the application materials and the documents listed above submitted during the public hearings, the Commission concludes that the proposed Project as conditioned will not have significant or cumulative effects upon the interests of the Resource Area values of the Massachusetts Wetlands Protection Act and the Arlington Bylaw for Wetlands Protection when the conditions imposed herein are implemented to protect the Resource Area values. With these conditions contained, the Project meets the performance standards in the Act and Bylaw and implementing regulations.

For the foregoing reasons, the Commission approves this project under the Act and Bylaw with the conditions stated herein the applications for work at 51 Grove Street, the Arlington Department of Public Works Facility.

ADDITIONAL SPECIAL CONDITIONS

In addition to the General Conditions (numbered 1 – 20 above), the Project is subject to the following Additional Special Conditions (under both the Act and Bylaw) only for those portions of the project within the Conservation Commission's jurisdiction:

I. PRE-CONSTRUCTION

- 21. Work permitted by this Order and Permit shall conform to the Notice of Intent, the approved plans and documents (listed above), and oral representations (as recorded in hearing minutes) submitted or made by the Applicant and the Applicant's agents or representatives, as well as any plans and other data, information or representations submitted per these Conditions and approved by the Commission.
- 22. The provisions of this Order and Permit shall apply to and be binding upon the Applicant and Applicant's assignees, tenants, property management company, employees, contractors, and agents.
- 23. No work shall begin under this Order until: (a) all other required permits or approvals have been obtained and (b) the appeal period of ten (10) business days from the date of issue of this Order has expired without any appeal being filed, and (c) this Order has been recorded in the Registry of Deeds. No work shall be started under this Permit until all other necessary permits or approvals have been obtained.

ARLINGTON CONSERVATION COMMISSION

APPROVAL ORDER OF CONDITIONS 51 Grove Street, DPW Renovation DEP FILE NO. 091-0326

24. The Applicant shall ensure that a copy of this Order of Conditions and Permit for work, with any referenced plans, is available on site at all times, and that all contractors, site managers, foremen, and sub-contractors understand its provisions.
25. This permit and its conditions, and the referenced and approved site plans listed in this permit shall be included in all relevant bid materials.
26. Prior to starting work, the Applicant shall submit to the Commission the names and 24-hour phone numbers of project managers or the persons responsible for site work or mitigation.
27. Before work begins, erosion and sediment controls shall be installed at the limits of the work area. These will include a silt fence and minimum 12 inch compost filter sock around the entire work area (hay bales are not allowed).
28. The contractor shall contact the Conservation Agent (concomm@town.arlington.ma.us ; 781-316-3012) to arrange for a pre-construction meeting with the onsite project manager to walk through the Order of Conditions and walk the site to confirm the installation and placement of erosion controls prior to the start of any grading or construction work.
29. The contractor shall provide written Notice of the work start date to the Conservation Agent 48 hours prior to start of work.
30. The Commission, its employees, and its agents shall have the right of entry onto the site to inspect for compliance with the terms of this Order of Conditions and Permit until a Certificate of Compliance has been issued.
31. The Commission reserves the right to require an independent environmental monitor to monitor the project and report back to the Commission if it determines one is necessary at any time during the project's construction.

II. POST-CONSTRUCTION

32. When requesting a Certificate of Compliance, the Applicant shall provide a written statement by a registered professional engineer certifying substantial compliance with the plans and setting forth what deviation, if any, exists from the plans approved in the Order shall accompany the request for a Certificate of Compliance; the Applicant shall also provide at that time as-built plans stamped by such a professional.

III. DURING CONSTRUCTION

Dumpsters

33. No dumpsters shall be allowed within the 100 foot Buffer Zone or Adjacent Upland Resource Areas ("AURA") or other Resource Areas.

Stockpiling

34. No uncovered stockpiling of materials shall be permitted within the 100 foot Buffer Zone or Adjacent Upland Resource Areas ("AURA") or other Resource Areas.

ARLINGTON CONSERVATION COMMISSION

APPROVAL ORDER OF CONDITIONS 51 Grove Street, DPW Renovation DEP FILE NO. 091-0326

Erosion Control

35. Areas that are disturbed by construction and access activities shall as soon as possible be brought to final grade and reseeded and restabilized, and shall be done so prior to the removal of erosion control barriers.
36. Erosion control measures shall be installed per the approved plans.
37. At least 21 days prior to construction, a written dust mitigation plan using water as a dust control shall be submitted to the Conservation Commission. This dust mitigation plan shall be implemented through the duration of the project.

Equipment

38. No heavy equipment may be stored overnight within 50 feet of the brook and no refueling or maintenance of machinery shall be allowed within the 100-foot Buffer Zone, Adjacent Upland Resource Area, or within any Resource Area.

Sweeping

39. Any dirt or debris spilled or tracked onto any paved streets shall be swept up and removed daily.

Dewatering

40. Any dewatering operations shall conform to the following:
 - (a) Notify the Conservation Commission that dewatering is required.
 - (b) Any catch basins, drains, and outfalls to be used in dewatering operations shall be cleaned out before operations begin.
 - (c) Any water discharged as part of any dewatering operation shall be passed through filters, on-site settling basins, settling tank trucks, or other devices to ensure that no observable sediments or pollutants are carried into any Resource Area, street, drain, or adjacent property.
 - (d) Measures shall be taken to ensure that no erosion or scouring shall occur on public or private property, or on the banks or bottoms of water bodies, as a result of dewatering operations.

Plantings

41. All mitigation plantings and all plantings within resource areas and the buffer zone shall be native and be installed and maintained according to the standards of the American Association of Nurserymen (AAN). No cultivars of native plantings shall be allowed. **This shall be a continuing condition that survives the expiration of this permit /Order and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.**
42. The Applicant is permitted to use the cut-and-dab method for invasive plant management control. The Applicant shall hire a licensed herbicide applicator with at least 3 years of experience. The Applicant shall only use Massachusetts Department of Environmental Protection approved herbicides.
43. All plantings planted and invasive species removed through this project shall be monitored for three years. A survival rate of at least 80% must be maintained for the approved plantings at the end of the third monitoring year. If there is less than an 80% survival rate of the plantings after the third year, the Applicant must submit recommendations for replacements to the Conservation Agent for approval. A monitoring report shall be submitted annually in June for the three year monitoring period, reporting on the health of the new plantings and the success of the invasive plant management.

ARLINGTON CONSERVATION COMMISSION

APPROVAL ORDER OF CONDITIONS 51 Grove Street, DPW Renovation DEP FILE NO. 091-0326

44. The Applicant shall notify the Conservation Agent when the invasive removal and planting work along Mill Brook is scheduled so that the Conservation Agent can monitor the work.
45. The Applicant shall protect all area trees per the Town Wetlands Protection Regulations, Section 24 Vegetation Removal and Replacement, protecting trees through securing (not nailing) 2x4 boards, between 6-8 feet in length, around tree base. The boards shall be installed vertically such that one end is installed directly into the ground. Alternative protection measures must be approved by the Commission or its agent.

Chemicals

46. To avoid adding excess nitrogen runoff, the Applicant shall only treat the planted areas within the Commission's jurisdiction with slow release nitrogen fertilizer. Application of this fertilizer cannot occur in the summer, or after storm events. Lawn fertilizer shall only be applied twice a year, in spring and fall. The application of plant nutrients shall otherwise comply with 330 CMR 31.00. No other herbicides or treatment methods are approved unless otherwise noted in this order (see Condition #42). New plantings shall only be fertilized once, during the initial planting year. No pesticides or rodenticides shall be used to treat pest management issues within the 100-ft wetlands buffer, AURA, or other resource areas without prior notification to and review by the Conservation Agent. **This shall be a continuing condition that survives the expiration of this permit /Order and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.**

Pervious Surfaces

47. Pervious surfaces shown on the project plans shall be maintained and not be replaced by impervious surfaces. **This shall be a continuing condition that survives the expiration of this permit /Order and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.**

Mitigation

48. All mitigation as proposed as part of this project shall remain in perpetuity. The approved planting areas, invasive removal areas, the rain gardens, the water quality units, and the stormwater system shall remain in perpetuity and if replacement is necessary, shall be subject to the approval of the Commission. **This shall be a continuing condition that survives the expiration of this permit /Order and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.**

Stormwater

49. The Applicant shall submit an annual affirmation that maintenance of the underground storage chambers and approved water quality units is in place, which shall include the dates of their last service. All other structural stormwater BMPs shall be maintained in accordance with the approved Operation and Maintenance plans. It is sufficient to email the Conservation Agent with a statement of affirmation, and the statement must be submitted by December 31 each year. **This shall be a continuing condition that survives the expiration of this permit /Order and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.**
50. The Applicant shall submit copies of the SWPPP inspection reports to the Conservation Agent within 10 days of the date of each report.
51. The Applicant shall submit a snow storage plan to the Commission for review. No snow storage is permitted in the mitigation planting areas or within any resource areas. **This shall be a continuing**

ARLINGTON CONSERVATION COMMISSION

APPROVAL ORDER OF CONDITIONS 51 Grove Street, DPW Renovation DEP FILE NO. 091-0326

condition that survives the expiration of this permit /Order and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.

52. The Applicant shall coordinate with the Arlington High School on stormwater management in order to improve climate change resilience and preparedness, and to ensure accommodation of the 100-year storm drainage from the portion of the DPW site that discharges to the High School.

APPENDIX D

METHOD STATEMENT FOR APPLICATION OF GASKET INSTALLATION PROCEDURE

- 1) Prepare the groove by cleaning the gasket seating area using a cloth.
- 2) Using a brush, apply Tylox gasket adhesive/glue on the groove where the gasket needs to be seated as shown in figure 1.



Figure 1

- 3) Place the gasket on the groove such that the flat side of the gasket rests on the groove and the grip side faces the top as shown in figure 2.

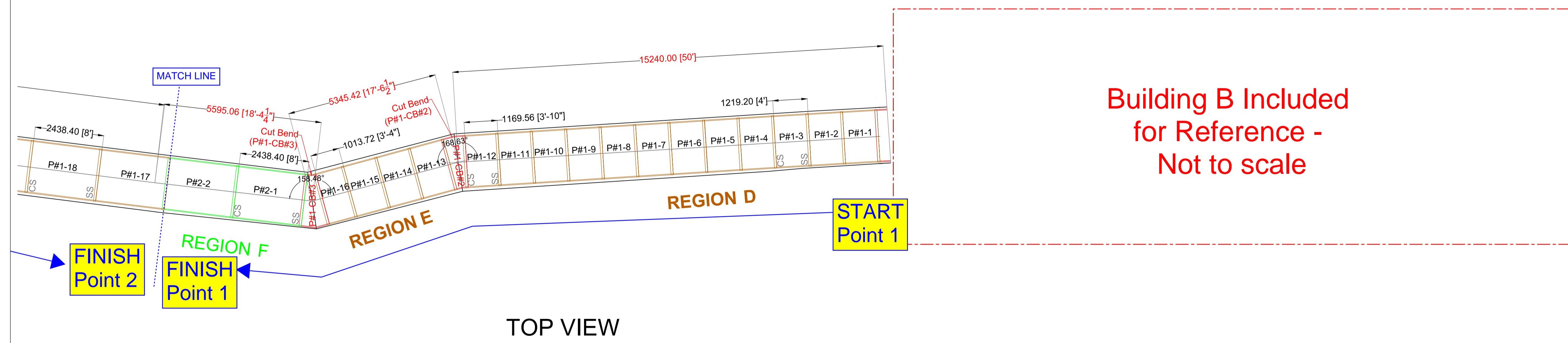


Figure 2

CB: Gasket Installation Plan and Procedure

- 4) Allow to cure. The curing time for the gasket glue is less than 20 minutes at a temperature of 25 deg C.
- 5) Apply grease on the entire spigot and inside the socket area and push the pipes together.
- 6) Ensure that there are no gaps above 5mm between the spigot and socket.

APPENDIX E



TOP VIEW

Total Length = 315.7ft

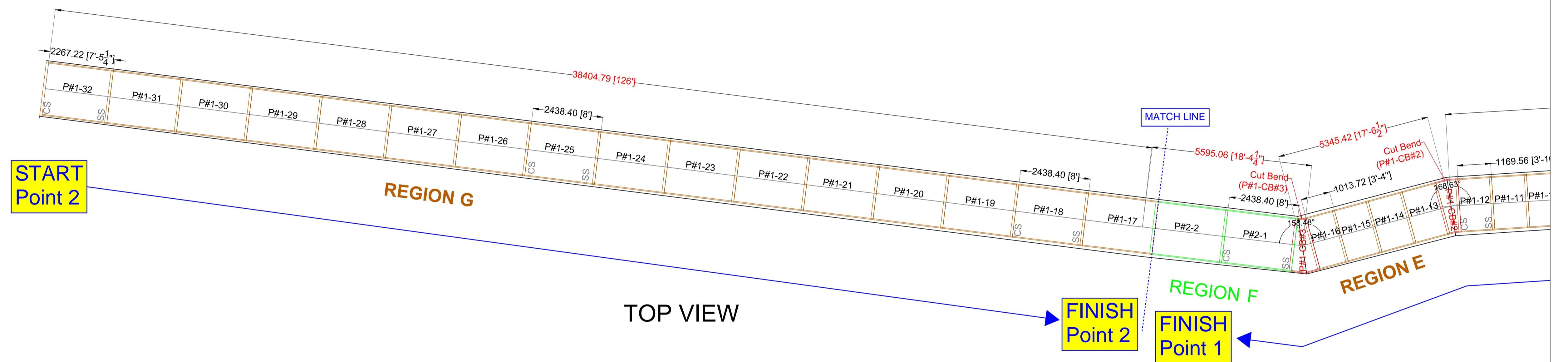
CS - Collar Side

SS - Spigot Side

Layout (Region D to Region F)

CUSTOMER APPROVAL

Name of Company _____
Address _____
Date _____
Signature _____



Total Length = 315.7ft

CS - Collar Side

SS - Spigot Side

Layout (Region F to Region G)

CUSTOMER APPROVAL

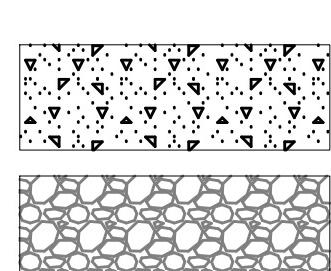
Name of Company _____

Address _____

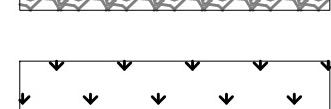
Date _____

Signature _____

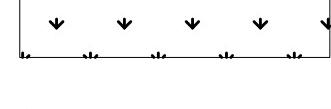
APPENDIX F



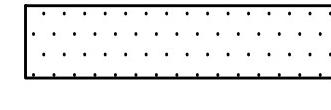
CONCRETE



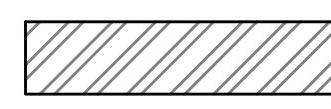
CRUSHED STONE



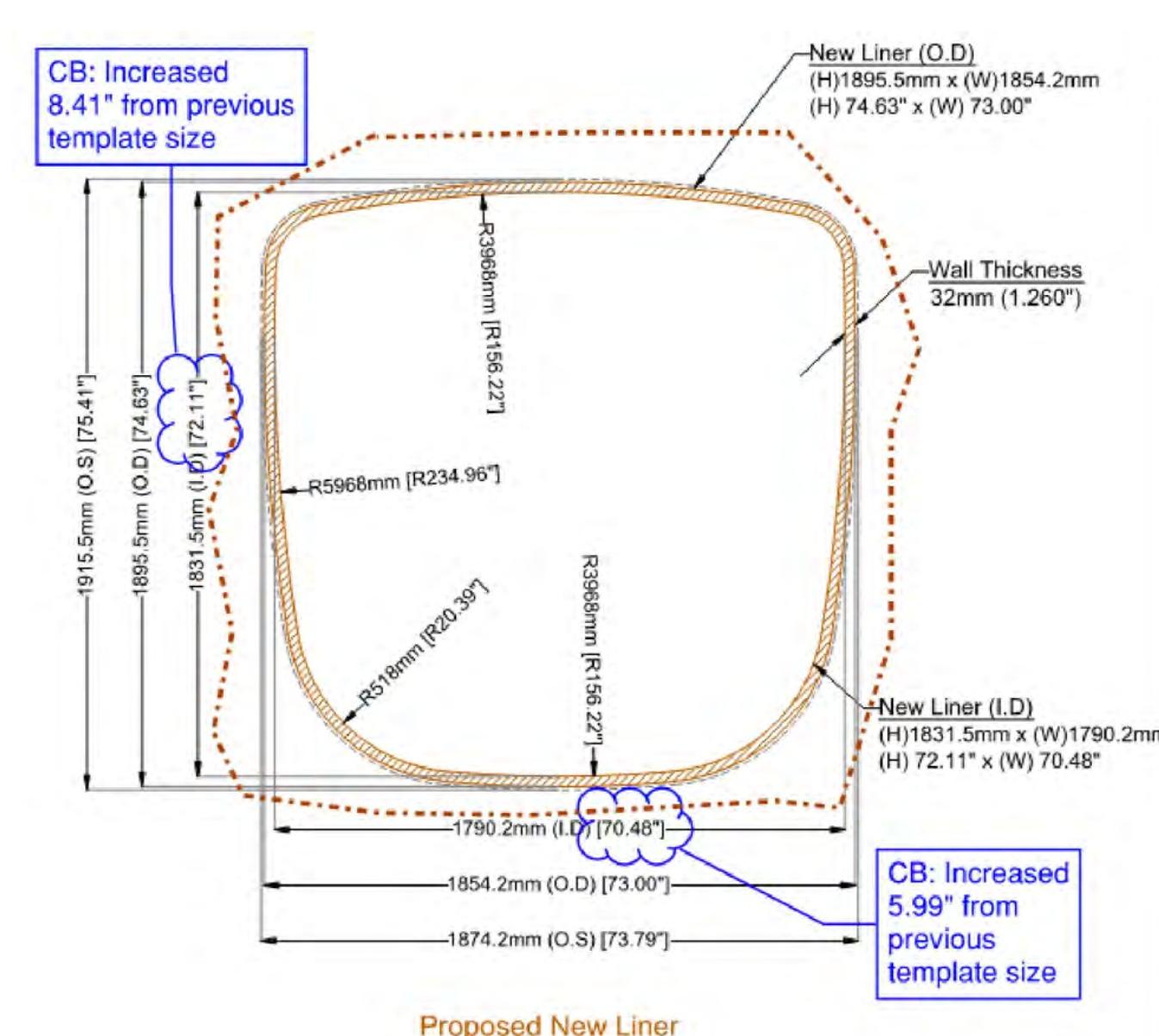
LANDSCAPED AREA



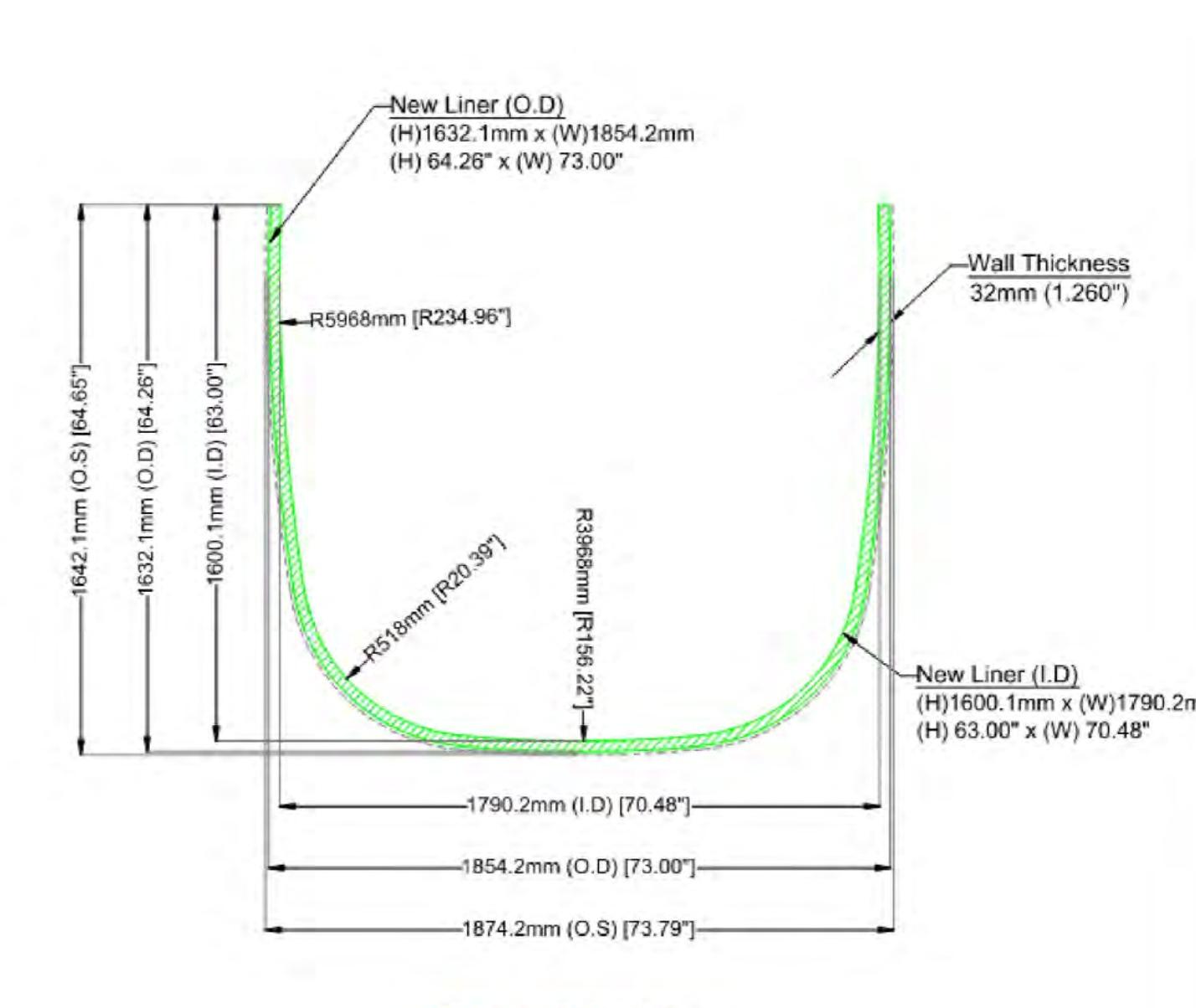
100 YEAR FLOOD LINE PER FEMA



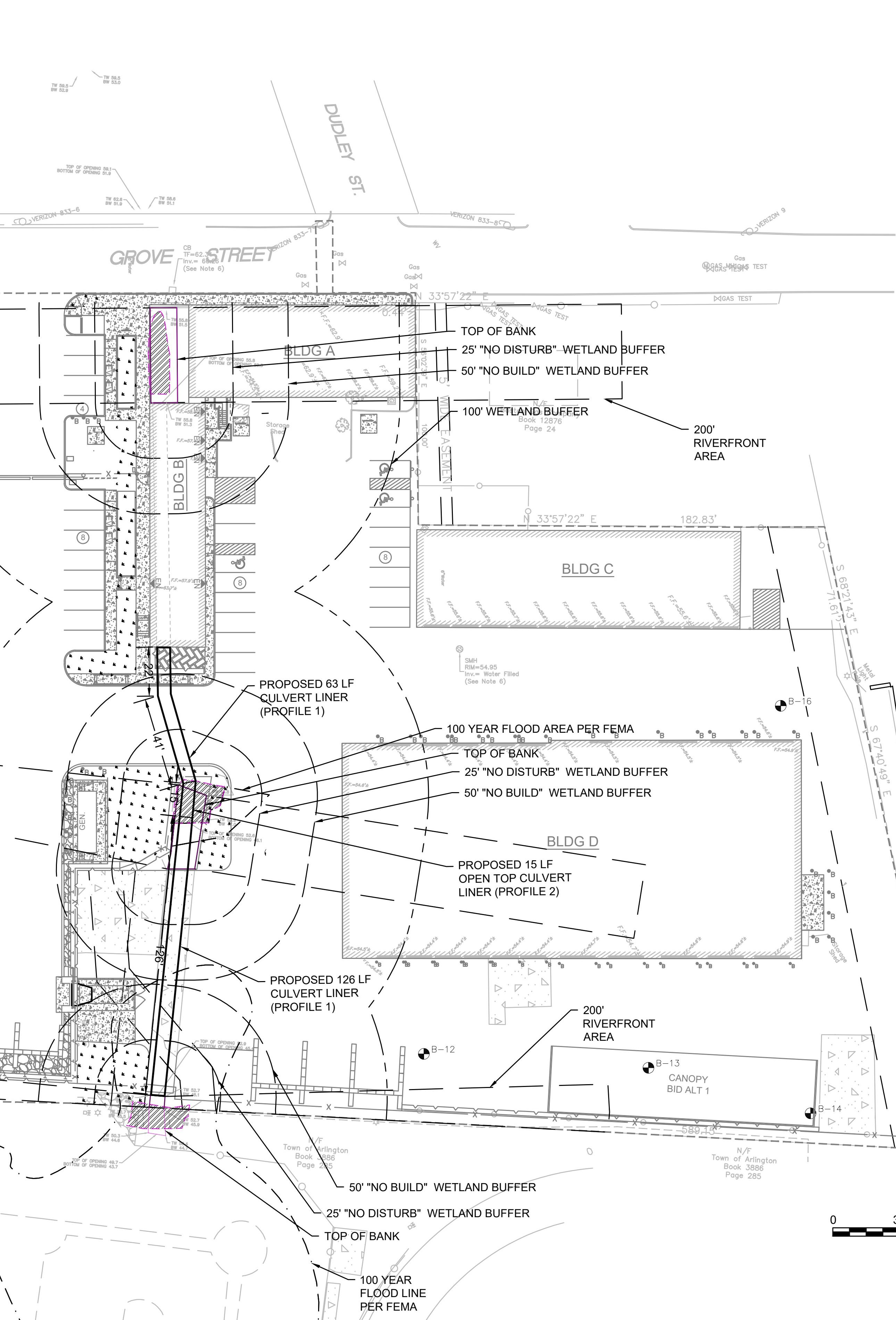
REGULATORY FLOODWAY PER FEMA



Proposed New Li Profile#1



Proposed New I
Profile#2



A diagram illustrating a coordinate system. A horizontal line segment at the bottom left has a thick black triangle pointing upwards and to the right. From the end of this segment, a vertical line extends upwards, ending in a circle with a crosshair. The text "NAD 83" is written diagonally above this circle. In the top right corner, the letter "N" is written vertically, representing North.

Consultar



PUBLIC WORKS FACILITY
INNOVATIONS & ADDITION
1 GROVE STREET
ARLINGTON, MA 02476

The logo for Weston & Sampson Engineers, Inc. It features the company name "Weston & Sampson" in a stylized font. The word "Weston" is in blue, "Sampson" is in green, and the ampersand (&) is also green. A blue circle surrounds the ampersand. A small "SM" symbol is located in the top right corner of the logo.

Consultar

Seal:

Issued Fr

1

SCALE: AS NOTED

Date: 1/24/2024

Drawn By: EC

Reviewed By: LFK

Approved By: LFK

Drawing Title:

1

6

C900



Town of Arlington, Massachusetts

Unpermitted Activity: 35 Beverly Road

Summary:

Unpermitted Activity: 35 Beverly Road.

ATTACHMENTS:

Type	File Name	Description
□ Reference Material	20240114_130836.jpg	20240114_130836
□ Reference Material	20240114_131643.jpg	20240114_131643







Town of Arlington, Massachusetts

DEP #091-0357: Notice of Intent: 51 Burch Street (Continuation from 2/1/2024)

Summary:

This public hearing will consider a Notice of Intent to demolish a single-family dwelling and construct a two-family dwelling and associated site appurtenances at 51 Burch Street within Bordering Land Subject to Flooding.

ATTACHMENTS:

Type	File Name	Description
<input type="checkbox"/> Reference Material	51_Burch_St_-_SW_Application.pdf	51 Burch St - SW Application
<input type="checkbox"/> Reference Material	51_BURCH_STORMWATER_REPORT.pdf	51 BURCH STORMWATER REPORT
<input type="checkbox"/> Reference Material	51_Burch NOI SITE REV_1.pdf	51 Burch NOI SITE REV_1

RE: 51 Burch st- SW Application

Michael Novak <mnovak@patriot-eng.com>

Mon 2/5/2024 9:23 PM

To:Albert Azatyants <albert@unionsqcapital.com>;William Copithorne <wcopithorne@town.arlington.ma.us>
Cc:ConComm <ConComm@town.arlington.ma.us>;Michael Ciampa <mciampa@town.arlington.ma.us>;Wolfgang Kirstein <wkirstein@town.arlington.ma.us>;rkirby@lecenvironmental.com <rkirby@lecenvironmental.com>;Nicole Ferrara <nferrara@lecenvironmental.com>

2 attachments (3 MB)

51 Burch NOI_SITE_REV_1.pdf; 51 BURCH STORMWATER REPORT.pdf;

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Bill,

Please see the attached revised plan and report in response to you comments. Also I have provided a response to each item below (in red). Please let me know if you need paper copies, and if so how many of each.

Thanks,
Michael Novak
978-726-2654

On Tue, Jan 9, 2024 at 10:57 AM William Copithorne <wcopithorne@town.arlington.ma.us> wrote:

All,

In advance of the upcoming Conservation Commission meeting, I wanted to forward along some preliminary comments on the submitted documents. Please note that these comments are subject to change as the review is finalized and that approval of the Major Stormwater Permit has not yet been granted by the Engineering Division:

- Porous Pavers: No design detail(s)/profile(s) has been provided for the proposed porous pavers. Design details must be provided for review to ensure compliance with the Town's requirements for porous surfaces, otherwise the surfaces will be considered impervious.
I have update the detail for this section of paver on the detail sheet (sheet2) of the plan set. I have also hatched and dimension the areas on the site plan (sheet 1) to outline where the infiltration will occur.
- Test Pits: Test pits are noted on the plan but accompanying soil logs have not been provided to confirm site conditions. This information will be required for review in addition to the provided Web Soil Survey mapping.
The onsite soil logs have been included on the detail sheet (sheet 2) of the plan set attached.
- Proposed SW Rates (DP-2): I believe there is a typo for the 10-year storm as you are currently showing an increase in the proposed rate compared to existing.
Typo have been addressed in the attached report.
- Storm Data: Precipitation data for modelling is acceptable. Typically we look at the 2, 10, 25, and 100-yr storm, but 2, 10, 50, and 100 have been provided. The model results show

reductions in both rates and volumes for all modeled storms, and I expect the same would be true for the 25-yr storm.

Noted for future reference.

- Storage Volume: Storage volumes for the paver areas are available in the model, but overall storage volume is not readily presented on the plan or in the cover letter. I also see a depression in the back yard of the proposed development as well, which I assume is for on-site detention to meet ConComm requirements. These numbers should be clearly presented to aid in review.

I have update the detail for this section of paver on the detail sheet (sheet2) of the plan set to include the provided storage volume.

- Two Driveways: A second driveway is not allowed unless approved under a Special Permit. Please contact Inspectional Services if you have not already done so to review this proposal.
As Albert stated previously; As far as the second driveway- Yes we are filling a special permit
- I will have a number of additional comments in relation to Plan and Report requirements to meet the Rules & Regulations for Stormwater Bylaw reviews, but these will be more in regard to "aesthetics" than "function", so no need to get into those details now.

Please let me know if there are any needed changes.

I hope this helps for the upcoming meeting. I will plan to include the Conservation Commission on formal documents related to the Stormwater Bylaw review moving forward. In the meantime, please let me know if you have any questions.

-Bill

William C. Copithorne, P.E.
Assistant Town Engineer

Town of Arlington Department of Public Works
Engineering Division
51 Grove Street Arlington, MA 02476
781.316.3322

From: Albert Azatyants <albert@unionsqcapital.com>

Sent: Thursday, January 4, 2024 2:44 PM

To: William Copithorne <wcopithorne@town.arlington.ma.us>

Cc: ConComm <ConComm@town.arlington.ma.us>; Michael Ciampa <mciampa@town.arlington.ma.us>;

Mike Novak <mnovak@patriot-eng.com>; Wolfgang Kirstein <wkirstein@town.arlington.ma.us>

Subject: Re: 51 Burch st- SW Application

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Thank you! Will get in tomorrow

Albert Azatyants
617-861-5622

On Thu, Jan 4, 2024 at 2:43 PM William Copithorne <wcopithorne@town.arlington.ma.us> wrote:

148 of 291

AI,

Thank you for the submittal. Having checked the documents submitted, this project will be reviewed as a Major Stormwater Permit based on the area of proposed pervious pavers being greater than 1000-sf. The review fee will be \$300. Please submit a check in this amount written out to the "Town of Arlington" at your earliest convenience. I will provide detailed comments or approval (as applicable) following receipt. The Stormwater Bylaw allows up to 15 business days for the initial review, but I will at minimum try to have some update to the ConComm prior to your scheduled meeting even if it is not the formal response.

-Bill

William C. Copithorne, P.E.
Assistant Town Engineer

Town of Arlington Department of Public Works
Engineering Division
51 Grove Street Arlington, MA 02476
781.316.3322

From: Albert Azatyants <albert@unionsqcapital.com>
Sent: Wednesday, December 27, 2023 7:30 PM
To: Mike Novak <mnovak@patriot-eng.com>; William Copithorne <wcopithorne@town.arlington.ma.us>; Wolfgang Kirstein <wkirstein@town.arlington.ma.us>
Subject: Re: 51 Burch st- SW Application

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Hi please see attached. For sw app do you need anything else?
Thanks

Albert Azatyants
617-861-5622

On Wed, Dec 27, 2023 at 12:54 PM Albert Azatyants <albert@unionsqcapital.com> wrote:

Will: cc'd is Mike Novak. Can you please let us know what you need for the storm water application. We are planning on submitting to conservation commission on the 10th

Thanks

Albert Azatyants
617-861-5622

--

Albert Azatyants
c: 617-861-5622
albert@unionsqcapital.com

**STORMWATER REPORT
FOR
51 BURCH STREET ARLINGTON, MASSACHUSETTS**

**PREPARED FOR:
SA DEVELOPMENT
200F Main Street Box 352
Stoneham, MA 02180**

**PREPARED BY:
PATRIOT Engineering, LLC
PO BOX 362
Lexington, Massachusetts 02420
(978)726-2654**

**DATE: December 27, 2023
Revised February 5, 2024**





PO BOX 362
Lexington, MA 02420

VIA: EMAIL

December 27, 2023
Revised February 5, 2024

Ms. Susan Chapnick and
Members of the Conservation Commission
Town of Arlington, Town Hall
730 Mass Ave. Annex
Arlington, MA 02476

**Re: 51 Burch Street
Arlington, Massachusetts**

Dear Ms. Chapnick & Members of the Commission:

Patriot Engineering LLC (Patriot) is pleased to submit this letter and accompanying documentation in support of a Notice of Intent application for the project at 51 Burch Street in Arlington. The proposed site improvements will involve the razing of an existing single-family dwelling and the construction of a two-family dwelling with associated pervious paver drives for each unit. The proposed structure will be constructed on foundation piers to accommodate the needed flood storage for the property.

The existing topography for the subject parcel results in water runoff to two (2) locations; the southern (side) property line and the western (rear) property line. These locations have been chosen as the design points for the stormwater analysis. The proposed site improvements will mostly mimic existing drainage patterns except that all runoff will be directed to the western (rear) property line. Through the addition of a pervious paver driveways with stone beneath designed to capture and infiltrate stormwater runoff from each roof area of the proposed dwelling; the stormwater runoff rates and volumes will not increase in the proposed conditions.

The HydroCAD analysis summary below shows that with the proposed mitigation efforts for the site improvements will not result in an increase in peak rate of stormwater surface runoff during the 2, 10, 50, and 100-year design storms.

DP-1/100		<u>Existing (Pre)</u>		<u>Proposed (Post)</u>	
<u>Storm Event</u>		<u>Rate(cfs)</u>	<u>Volume(cf)</u>	<u>Rate(cfs)</u>	<u>Volume(cf)</u>
2-Year (4.04 in./hr.)		0.10	219		0
10-Year (6.43 in./hr.)		0.10	440		0
50-Year (9.69 in./hr.)		0.20	762		0
100-Year (11.5 in./hr.)		0.30	945		0

DP-2/200	<u>Existing (Pre)</u>		<u>Proposed (Post)</u>	
	Storm Event	Rate(cfs)	Volume(cf)	Rate(cfs)
2-Year (4.04 in./hr.)	0.30	1,001	0.20	508
10-Year (6.43 in./hr.)	0.50	1,891	0.30	959
50-Year (9.69 in./hr.)	0.80	3,154	0.50	1,599
100-Year (11.5 in./hr.)	1.00	3,865	0.60	2,116

Accompanying this letter is:

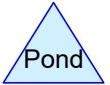
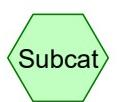
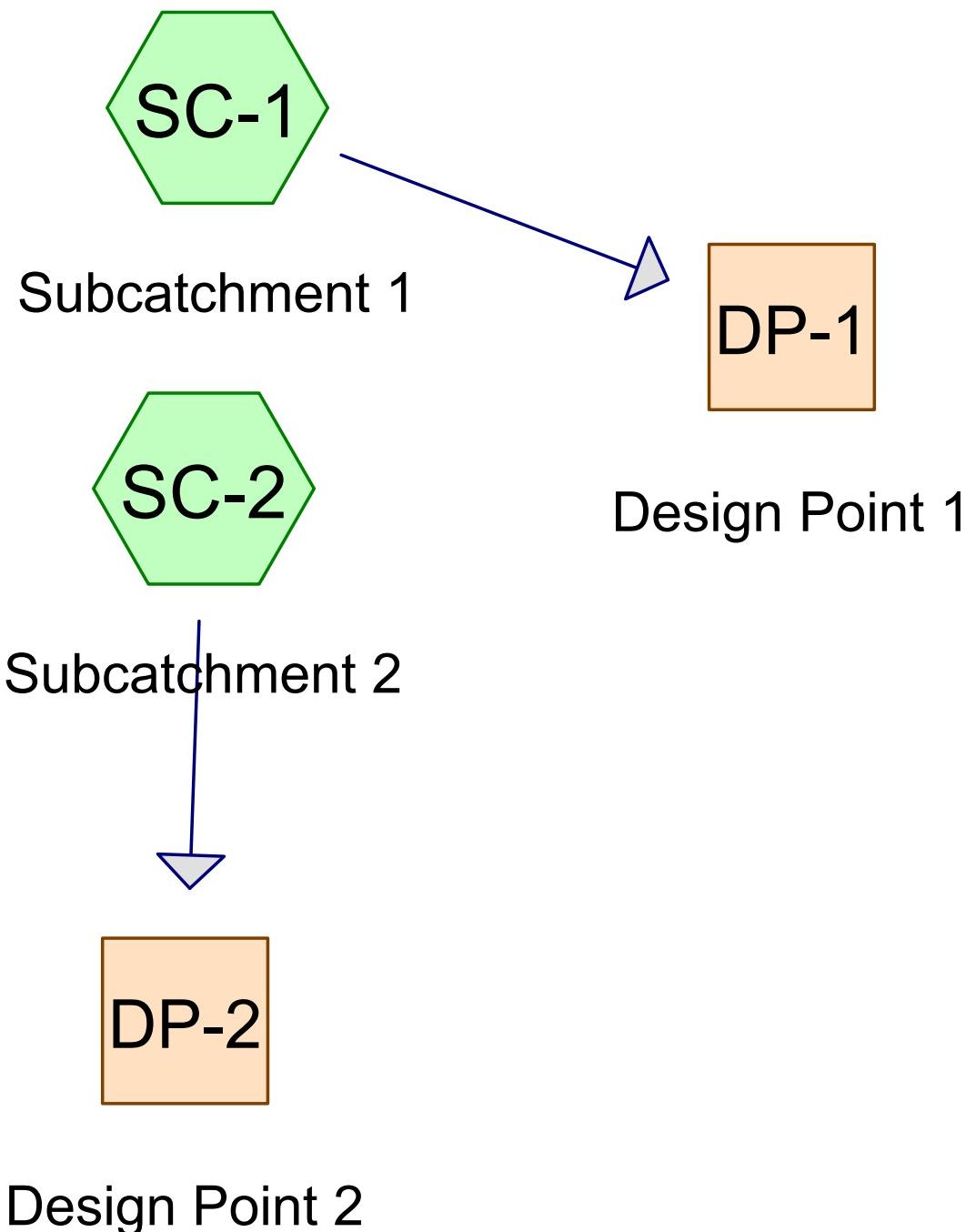
- A “Site Plan of Land” dated Revised February 5, 2024;
- “Stormwater Analysis and Calculations for 51 Burch Street” Revised February 5, 2024;
- A copy of the NRCS Soil Map showing the soil classification of that located on the locus property.
- An “Operation & Maintenance Program” dated Revised February 5, 2024.

We anticipate this information meets the requirements of the Town of Arlington Conservation Commission. Should you have any questions or require any further details, please feel welcome to email at mnovak@patriot-eng.com

Sincerely,

PATRIOT Engineering LLC,

Michael J Novak, P.E.



Routing Diagram for 51 BURCH-PRE
Prepared by Patriot Engineering, Printed 12/27/2023
HydroCAD® 10.10-4b s/n 11576 © 2020 HydroCAD Software Solutions LLC

51 BURCH-PRE

Prepared by Patriot Engineering

HydroCAD® 10.10-4b s/n 11576 © 2020 HydroCAD Software Solutions LLC

Printed 12/27/2023

Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr 24 Hr	Type III 24-hr		Default	24.00	1	4.04	2
2	10-Yr 24 Hr	Type III 24-hr		Default	24.00	1	6.43	2
3	50-Yr 24 Hr	Type III 24-hr		Default	24.00	1	9.69	2
4	100-Yr 24 Hr	Type III 24-hr		Default	24.00	1	11.50	2

Summary for Subcatchment SC-1: Subcatchment 1

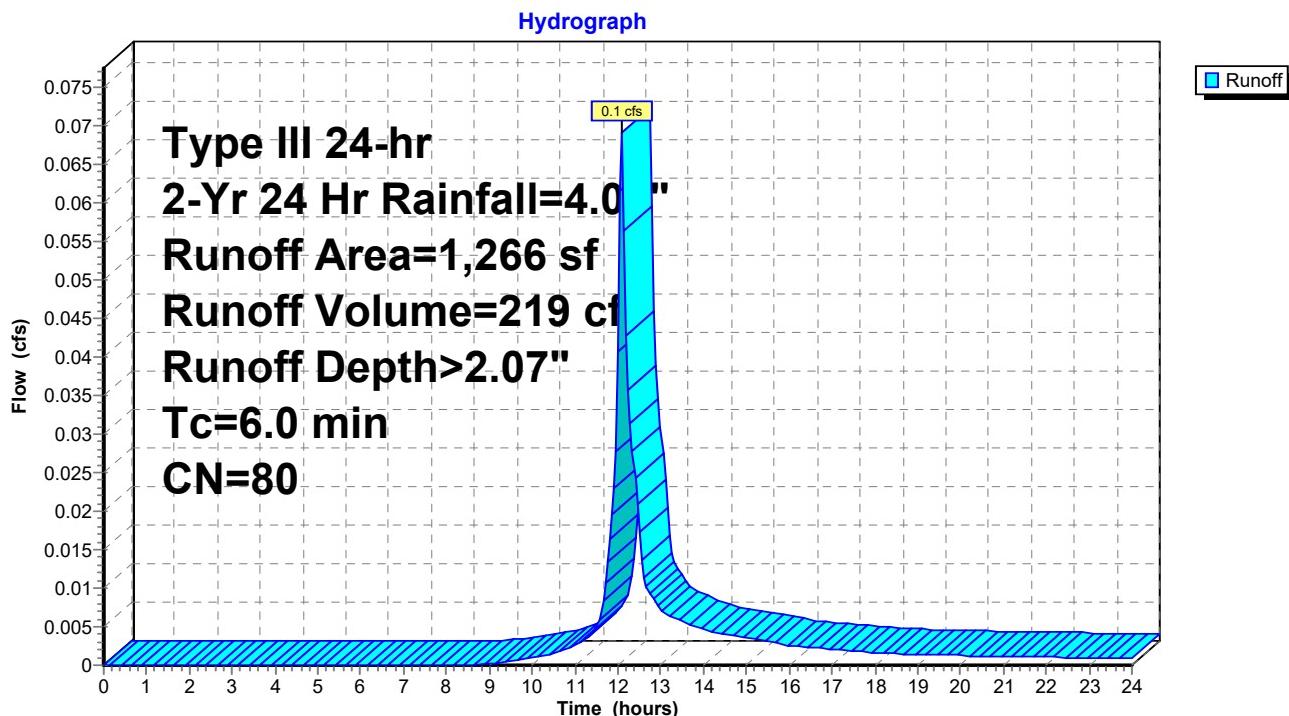
Runoff = 0.1 cfs @ 12.09 hrs, Volume= 219 cf, Depth> 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=4.04"

Area (sf)	CN	Description
1,266	80	>75% Grass cover, Good, HSG D
1,266		100.00% Pervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment SC-1: Subcatchment 1



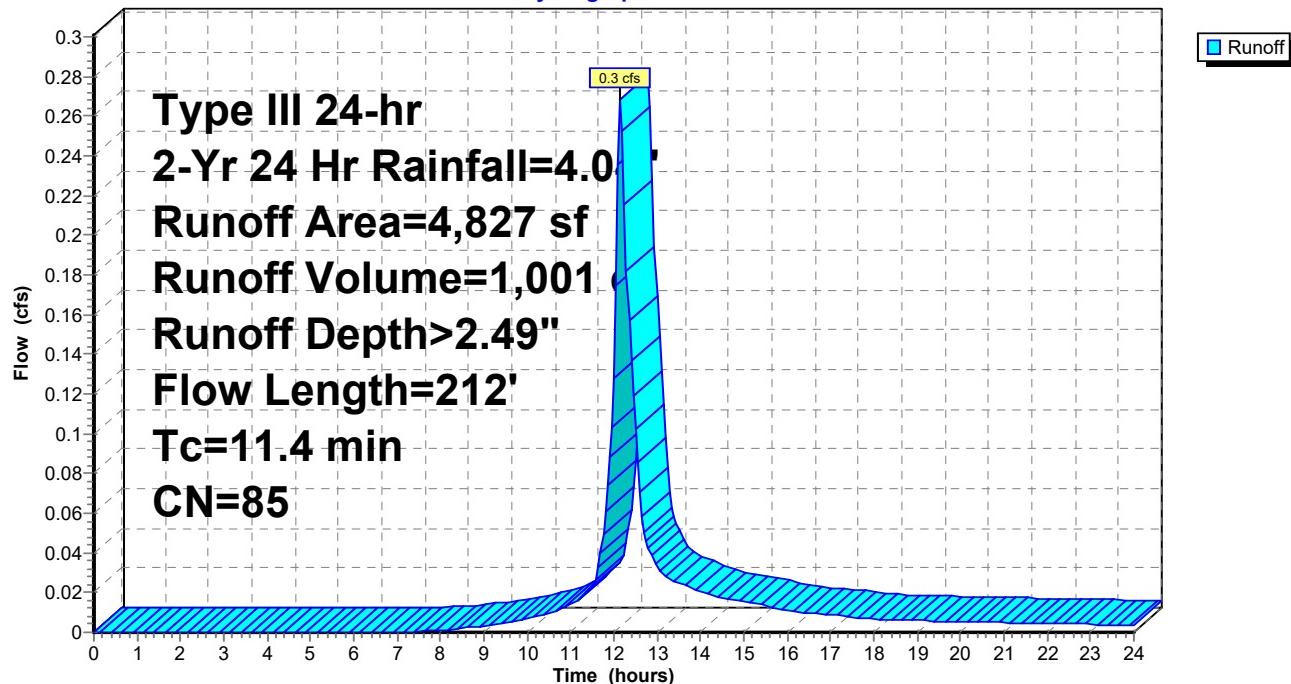
Summary for Subcatchment SC-2: Subcatchment 2

Runoff = 0.3 cfs @ 12.16 hrs, Volume= 1,001 cf, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Yr 24 Hr Rainfall=4.04"

Area (sf)	CN	Description
3,357	80	>75% Grass cover, Good, HSG D
*	354	Driveway/Walkways/Patios
*	98	Roof
4,827	85	Weighted Average
3,357		69.55% Pervious Area
1,470		30.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	21	0.0200	0.1		Sheet Flow, Grass: Short n= 0.150 P2= 4.04"
7.1	29	0.0200	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 4.04"
0.7	50	0.0600	1.2		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.8	76	0.1050	1.6		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.3	36	0.2000	2.2		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.4	212	Total			

Subcatchment SC-2: Subcatchment 2**Hydrograph**

Summary for Reach DP-1: Design Point 1

Inflow Area = 1,266 sf, 0.00% Impervious, Inflow Depth > 2.07" for 2-Yr 24 Hr event

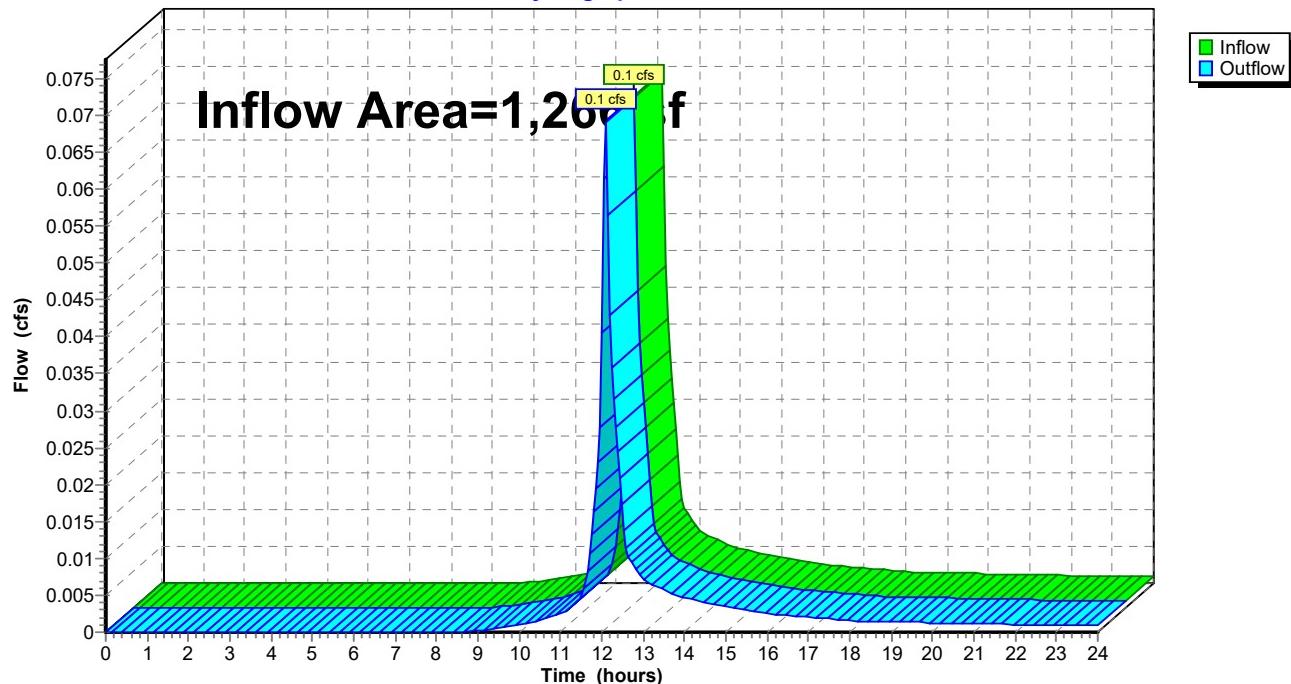
Inflow = 0.1 cfs @ 12.09 hrs, Volume= 219 cf

Outflow = 0.1 cfs @ 12.09 hrs, Volume= 219 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point 1

Hydrograph



Summary for Reach DP-2: Design Point 2

Inflow Area = 4,827 sf, 30.45% Impervious, Inflow Depth > 2.49" for 2-Yr 24 Hr event

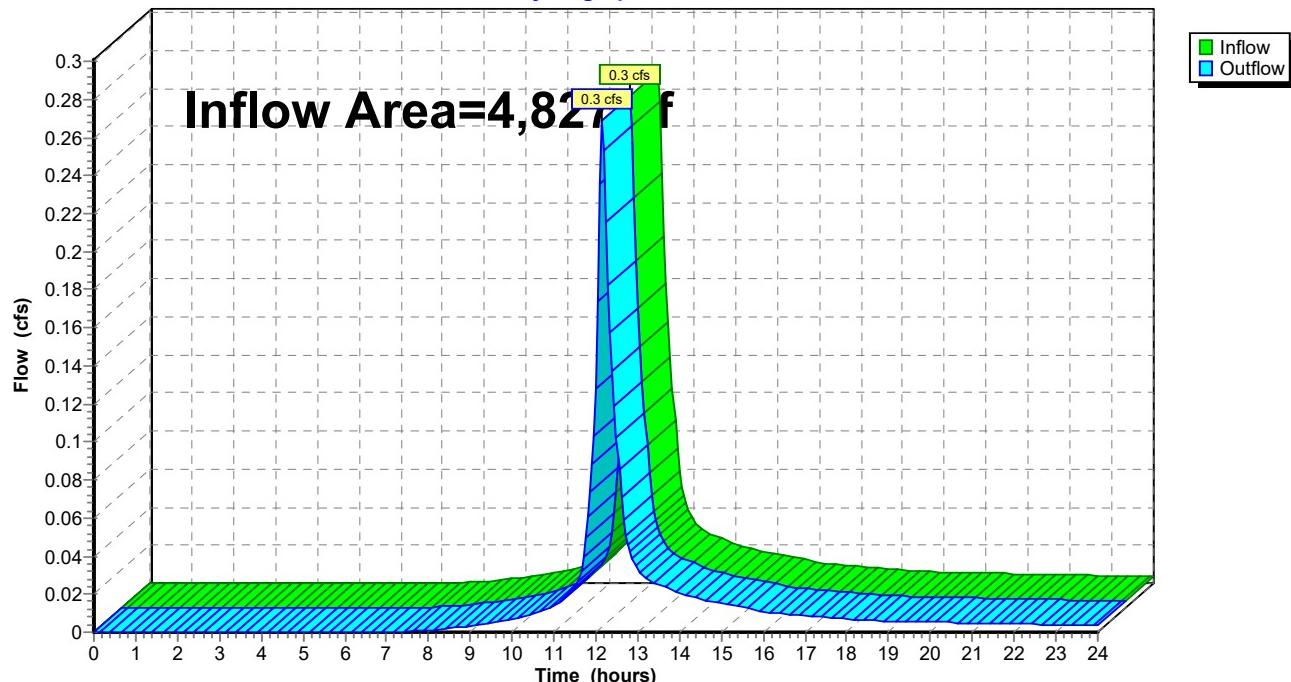
Inflow = 0.3 cfs @ 12.16 hrs, Volume= 1,001 cf

Outflow = 0.3 cfs @ 12.16 hrs, Volume= 1,001 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point 2

Hydrograph



Summary for Subcatchment SC-1: Subcatchment 1

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 440 cf, Depth> 4.17"

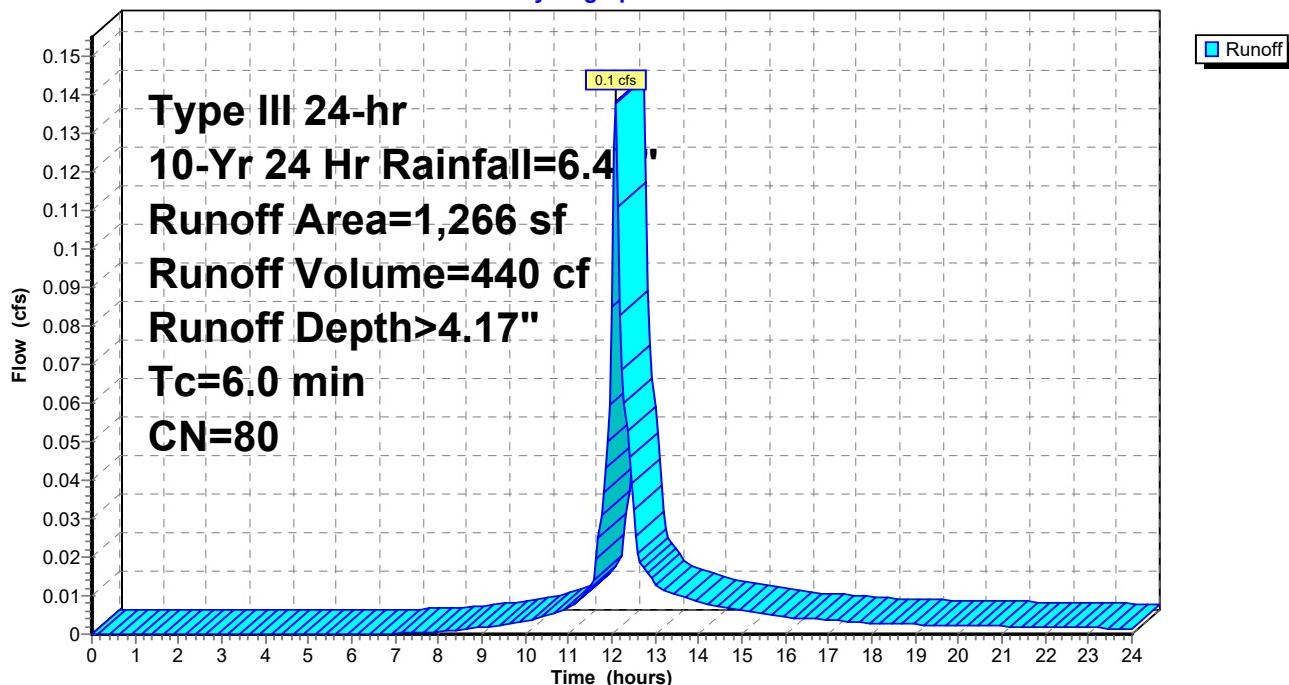
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=6.43"

Area (sf)	CN	Description
1,266	80	>75% Grass cover, Good, HSG D
1,266		100.00% Pervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment SC-1: Subcatchment 1

Hydrograph



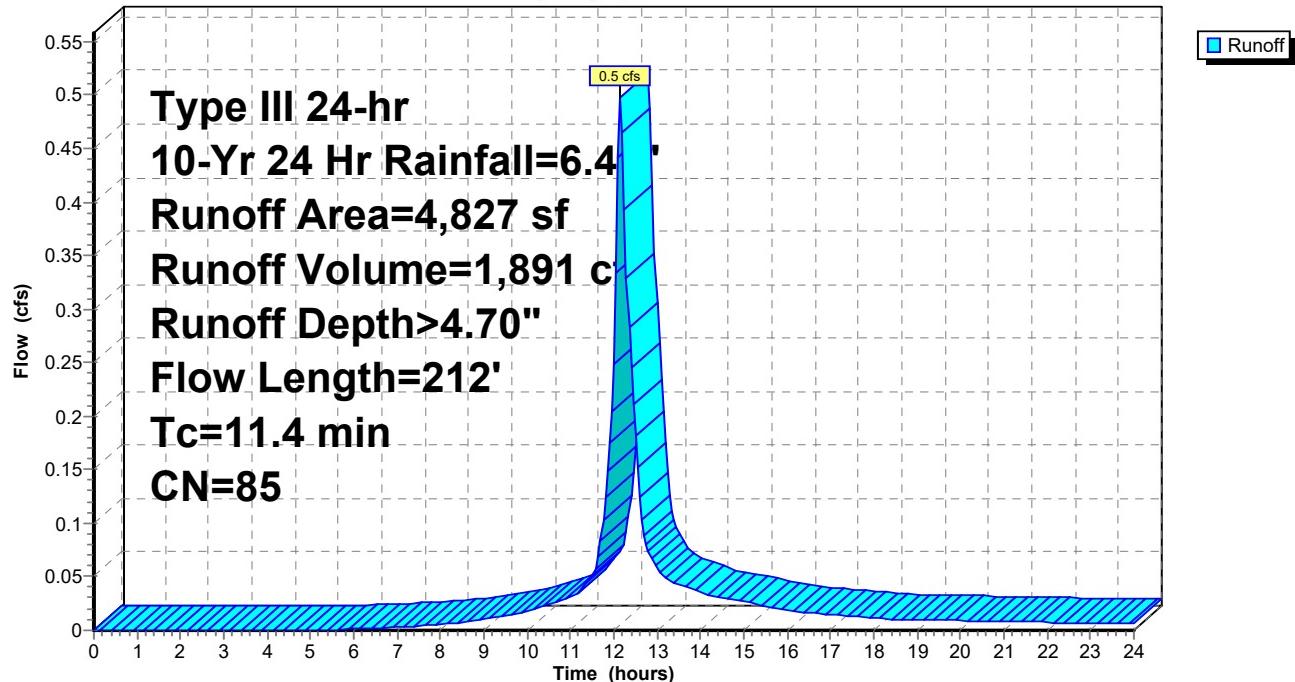
Summary for Subcatchment SC-2: Subcatchment 2

Runoff = 0.5 cfs @ 12.16 hrs, Volume= 1,891 cf, Depth> 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=6.43"

Area (sf)	CN	Description
3,357	80	>75% Grass cover, Good, HSG D
*	354	Driveway/Walkways/Patios
*	98	Roof
4,827	85	Weighted Average
3,357		69.55% Pervious Area
1,470		30.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	21	0.0200	0.1		Sheet Flow, Grass: Short n= 0.150 P2= 4.04"
7.1	29	0.0200	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 4.04"
0.7	50	0.0600	1.2		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.8	76	0.1050	1.6		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.3	36	0.2000	2.2		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.4	212	Total			

Subcatchment SC-2: Subcatchment 2**Hydrograph**

Summary for Reach DP-1: Design Point 1

Inflow Area = 1,266 sf, 0.00% Impervious, Inflow Depth > 4.17" for 10-Yr 24 Hr event

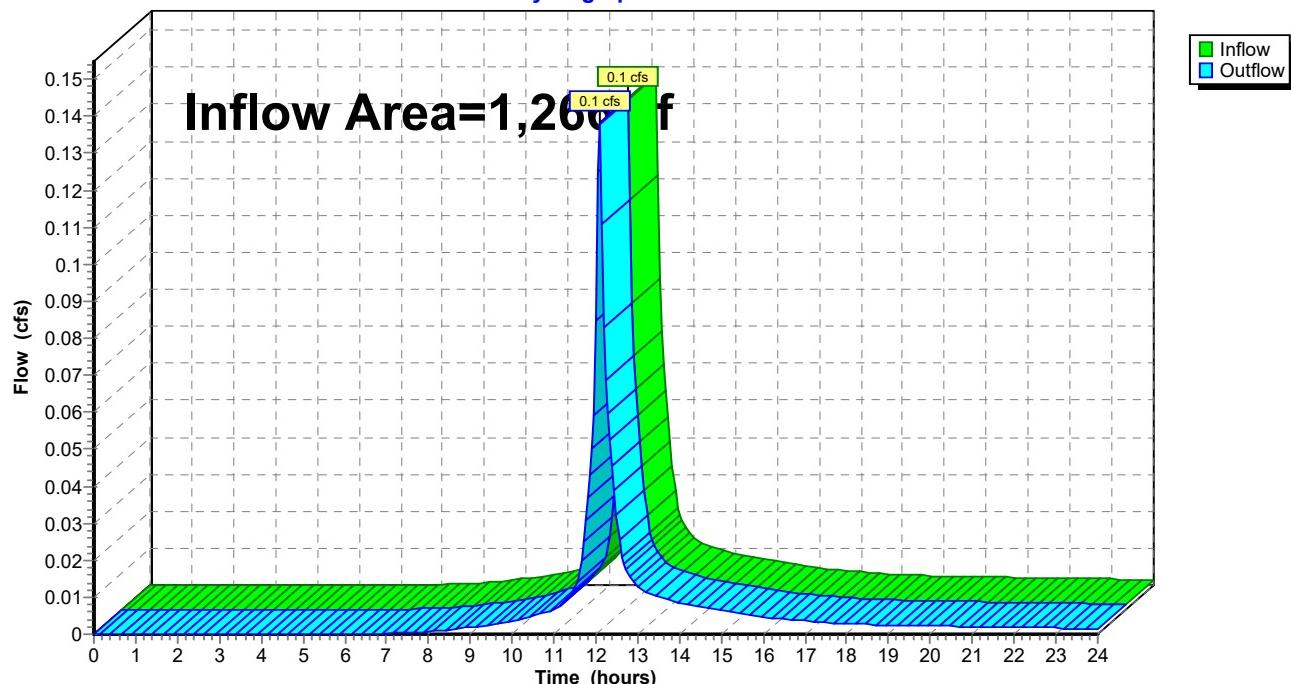
Inflow = 0.1 cfs @ 12.09 hrs, Volume= 440 cf

Outflow = 0.1 cfs @ 12.09 hrs, Volume= 440 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point 1

Hydrograph



Summary for Reach DP-2: Design Point 2

Inflow Area = 4,827 sf, 30.45% Impervious, Inflow Depth > 4.70" for 10-Yr 24 Hr event

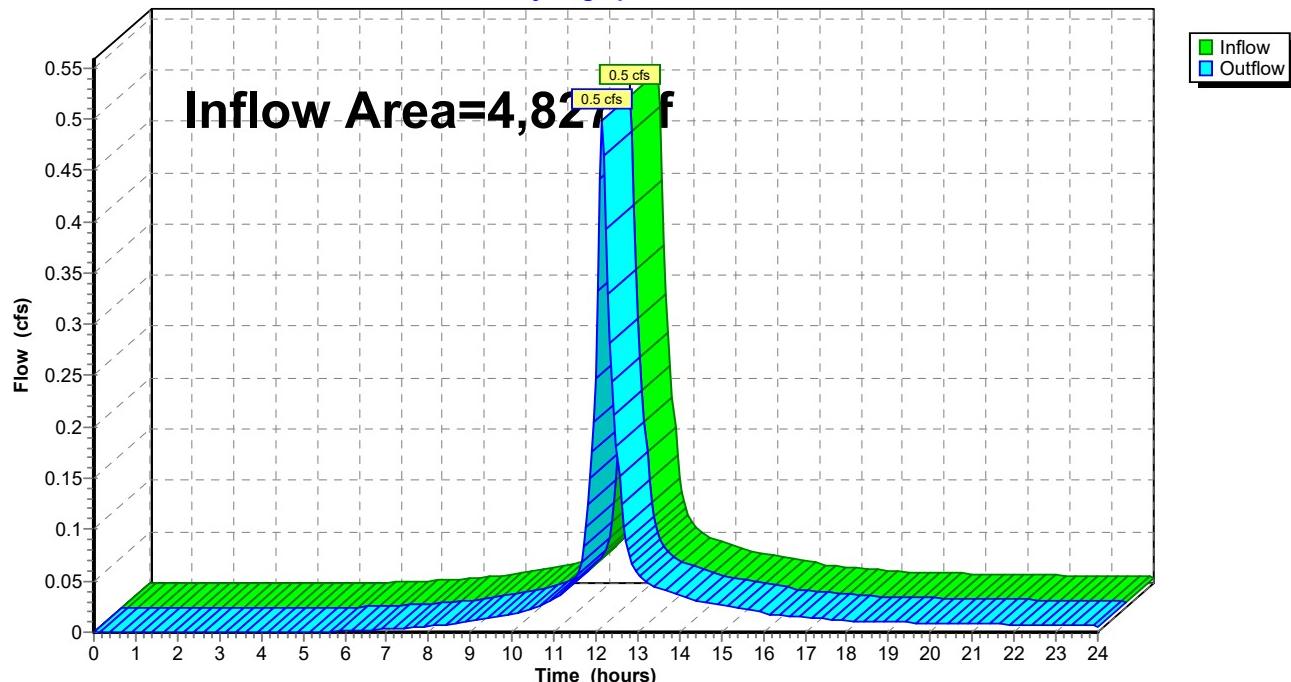
Inflow = 0.5 cfs @ 12.16 hrs, Volume= 1,891 cf

Outflow = 0.5 cfs @ 12.16 hrs, Volume= 1,891 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point 2

Hydrograph



Summary for Subcatchment SC-1: Subcatchment 1

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 762 cf, Depth> 7.22"

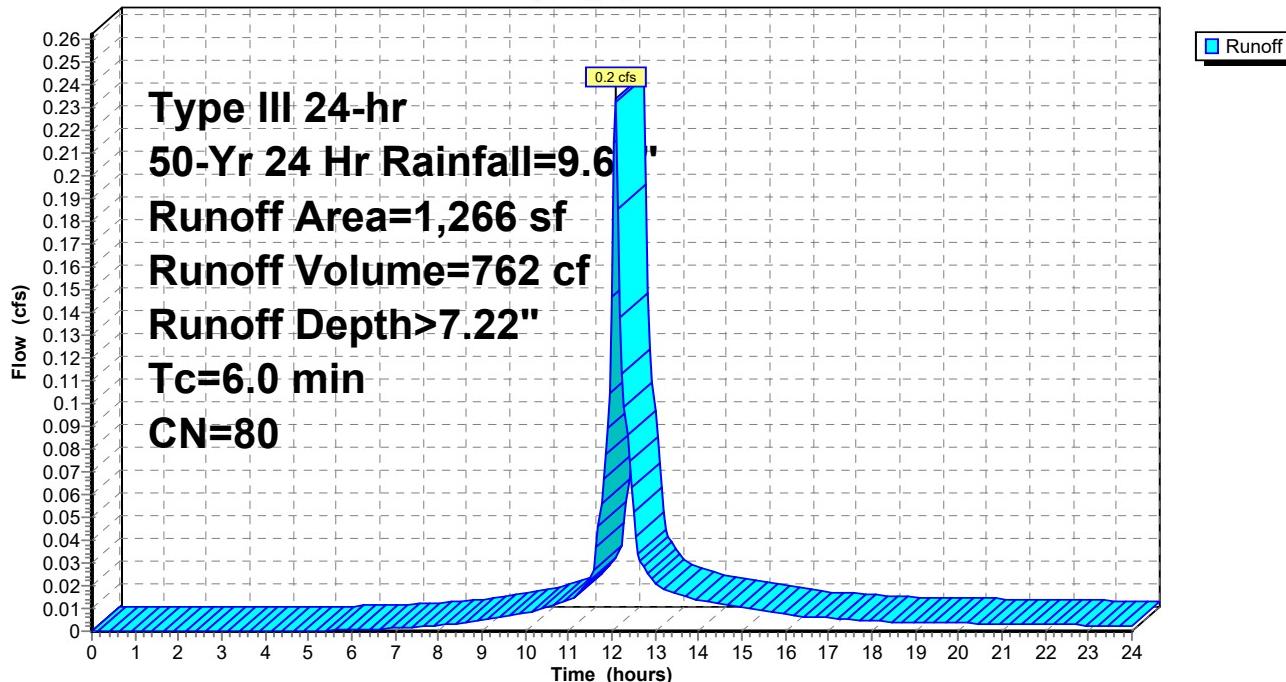
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Yr 24 Hr Rainfall=9.69"

Area (sf)	CN	Description
1,266	80	>75% Grass cover, Good, HSG D
1,266		100.00% Pervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment SC-1: Subcatchment 1

Hydrograph



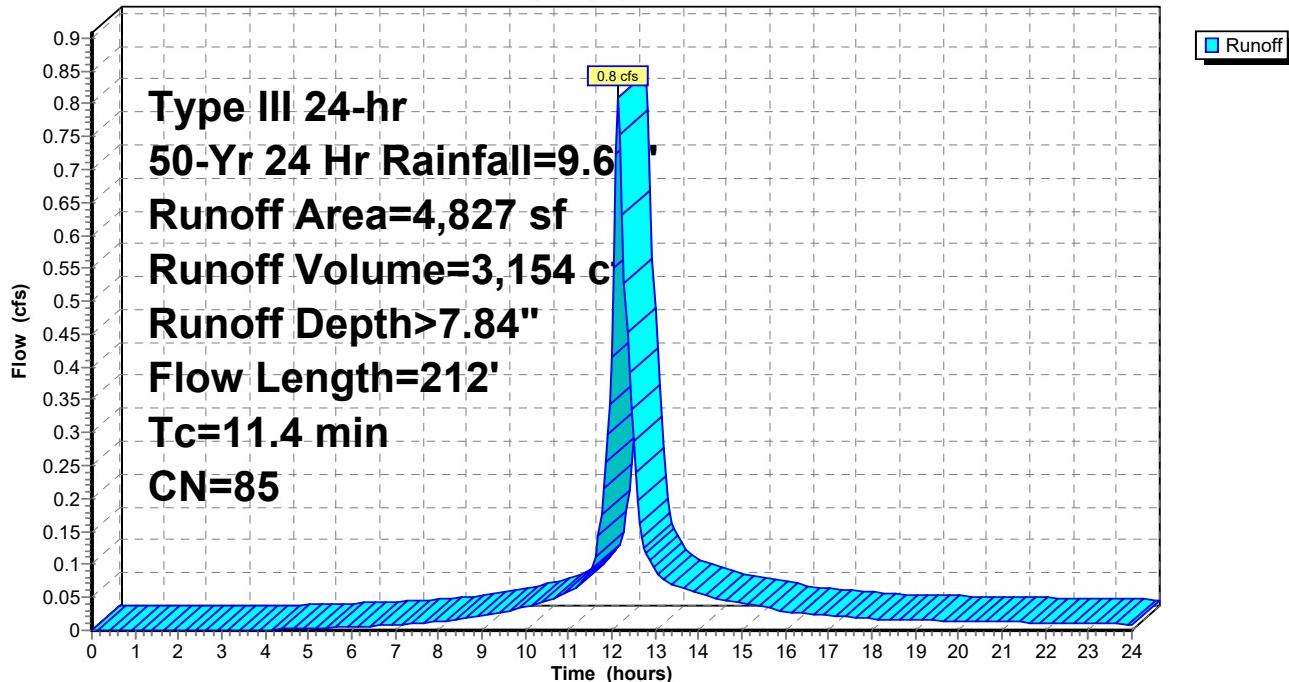
Summary for Subcatchment SC-2: Subcatchment 2

Runoff = 0.8 cfs @ 12.15 hrs, Volume= 3,154 cf, Depth> 7.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 50-Yr 24 Hr Rainfall=9.69"

Area (sf)	CN	Description
3,357	80	>75% Grass cover, Good, HSG D
*	354	Driveway/Walkways/Patios
*	98	Roof
4,827	85	Weighted Average
3,357		69.55% Pervious Area
1,470		30.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	21	0.0200	0.1		Sheet Flow, Grass: Short n= 0.150 P2= 4.04"
7.1	29	0.0200	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 4.04"
0.7	50	0.0600	1.2		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.8	76	0.1050	1.6		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.3	36	0.2000	2.2		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.4	212	Total			

Subcatchment SC-2: Subcatchment 2**Hydrograph**

Summary for Reach DP-1: Design Point 1

Inflow Area = 1,266 sf, 0.00% Impervious, Inflow Depth > 7.22" for 50-Yr 24 Hr event

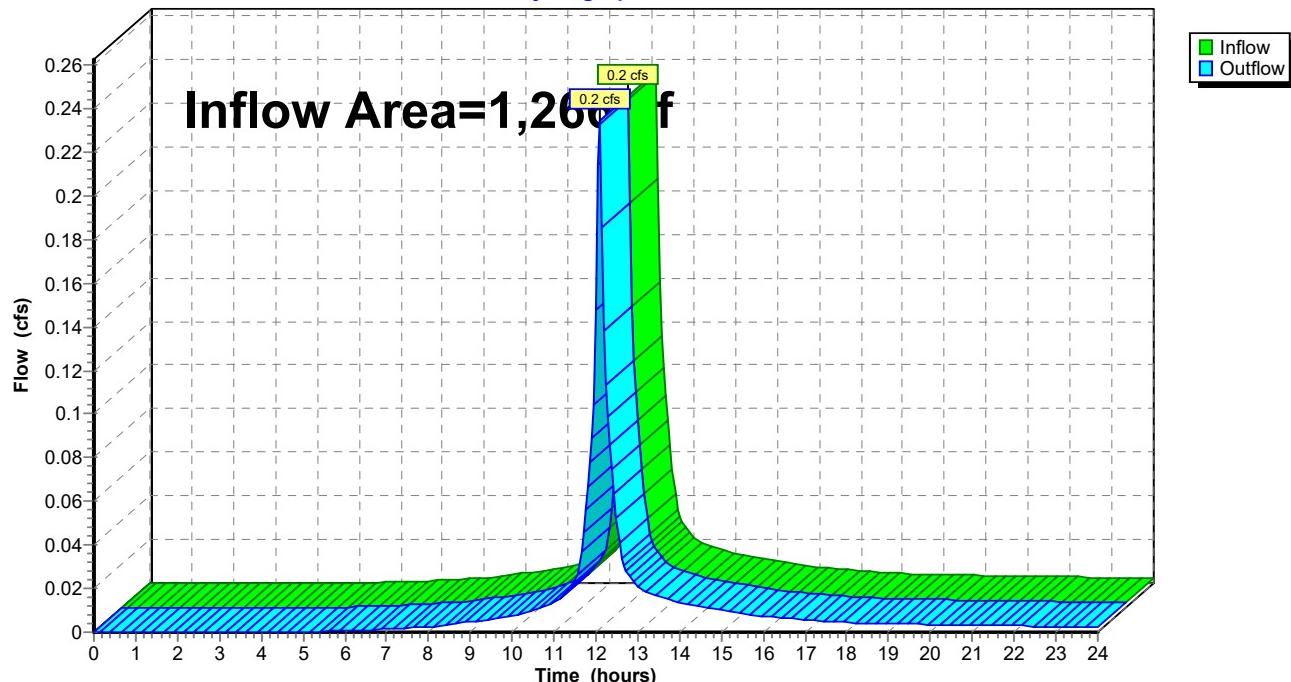
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 762 cf

Outflow = 0.2 cfs @ 12.09 hrs, Volume= 762 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point 1

Hydrograph



Summary for Reach DP-2: Design Point 2

Inflow Area = 4,827 sf, 30.45% Impervious, Inflow Depth > 7.84" for 50-Yr 24 Hr event

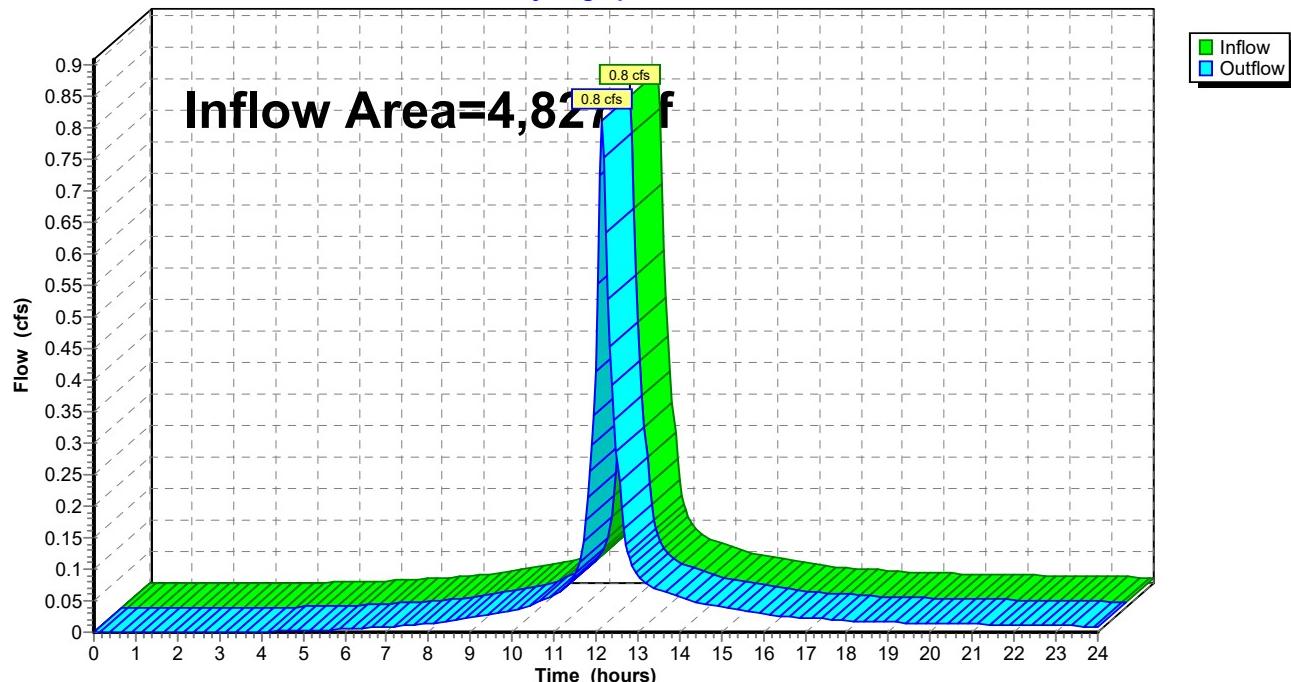
Inflow = 0.8 cfs @ 12.15 hrs, Volume= 3,154 cf

Outflow = 0.8 cfs @ 12.15 hrs, Volume= 3,154 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point 2

Hydrograph



Summary for Subcatchment SC-1: Subcatchment 1

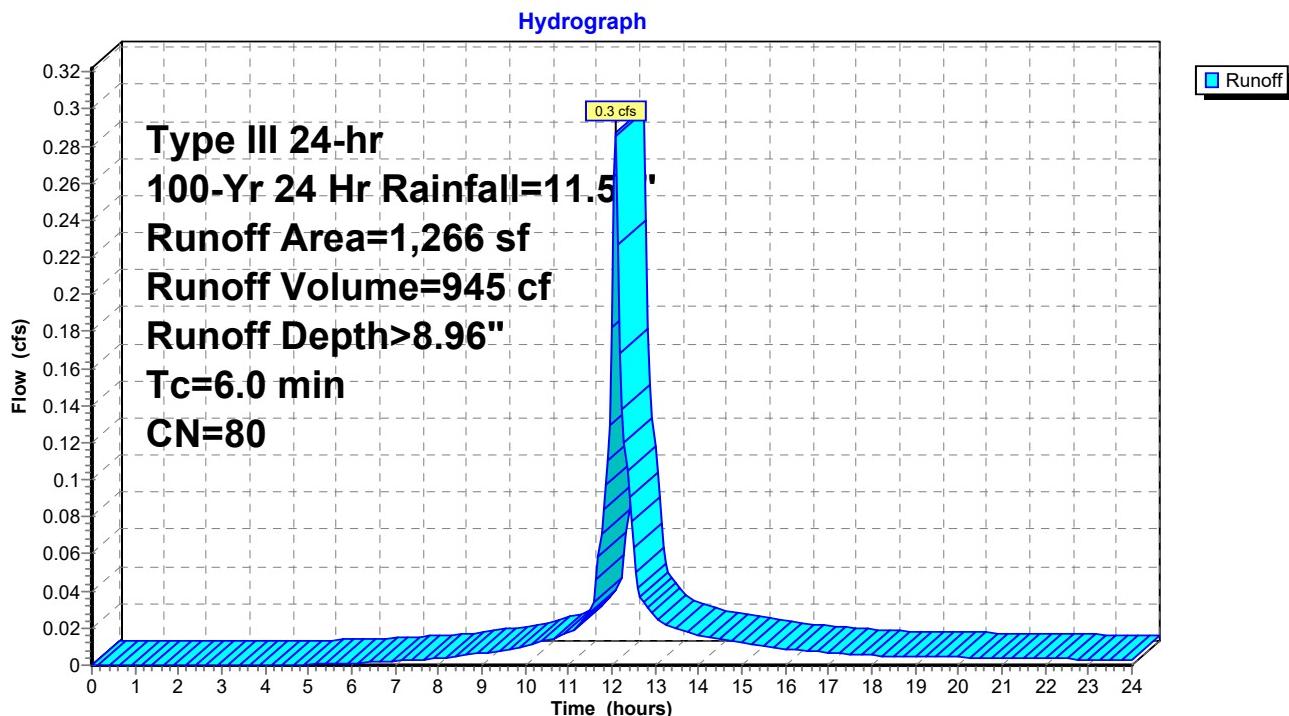
Runoff = 0.3 cfs @ 12.09 hrs, Volume= 945 cf, Depth> 8.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=11.50"

Area (sf)	CN	Description
1,266	80	>75% Grass cover, Good, HSG D
1,266		100.00% Pervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment SC-1: Subcatchment 1



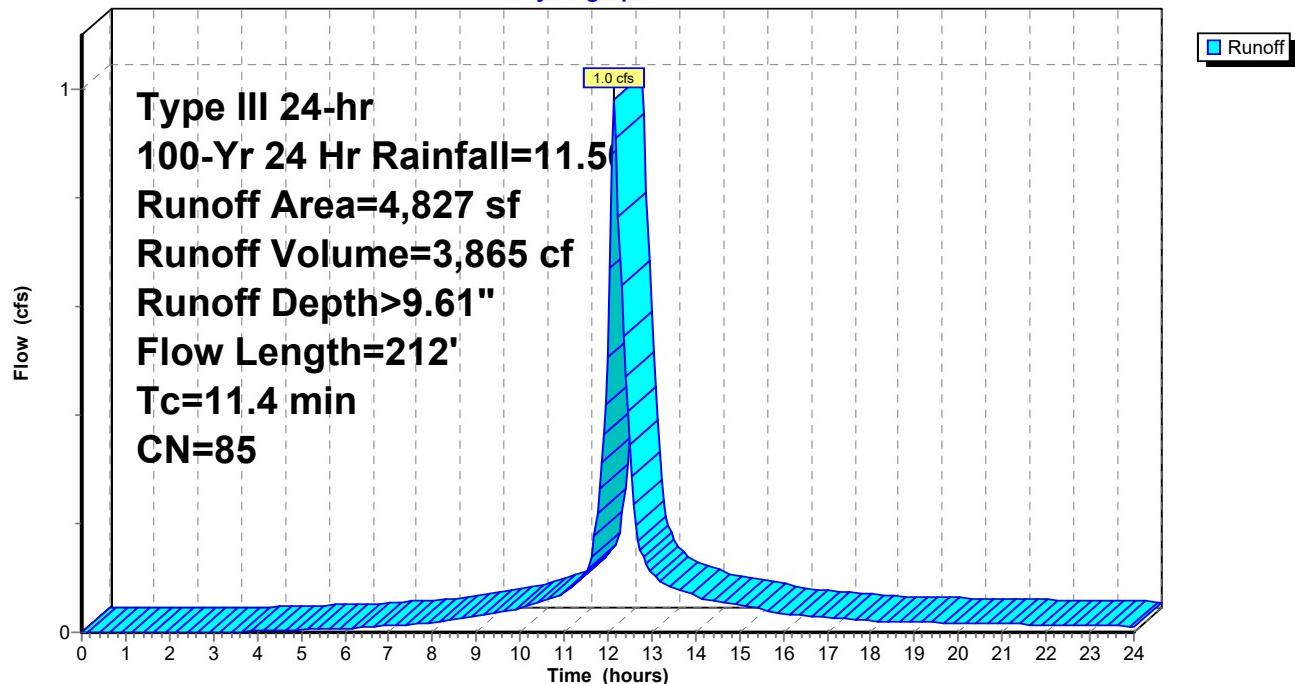
Summary for Subcatchment SC-2: Subcatchment 2

Runoff = 1.0 cfs @ 12.15 hrs, Volume= 3,865 cf, Depth> 9.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Yr 24 Hr Rainfall=11.50"

Area (sf)	CN	Description
3,357	80	>75% Grass cover, Good, HSG D
*	354	Driveway/Walkways/Patios
*	98	Roof
4,827	85	Weighted Average
3,357		69.55% Pervious Area
1,470		30.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	21	0.0200	0.1		Sheet Flow, Grass: Short n= 0.150 P2= 4.04"
7.1	29	0.0200	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 4.04"
0.7	50	0.0600	1.2		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.8	76	0.1050	1.6		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.3	36	0.2000	2.2		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.4	212	Total			

Subcatchment SC-2: Subcatchment 2**Hydrograph**

Summary for Reach DP-1: Design Point 1

Inflow Area = 1,266 sf, 0.00% Impervious, Inflow Depth > 8.96" for 100-Yr 24 Hr event

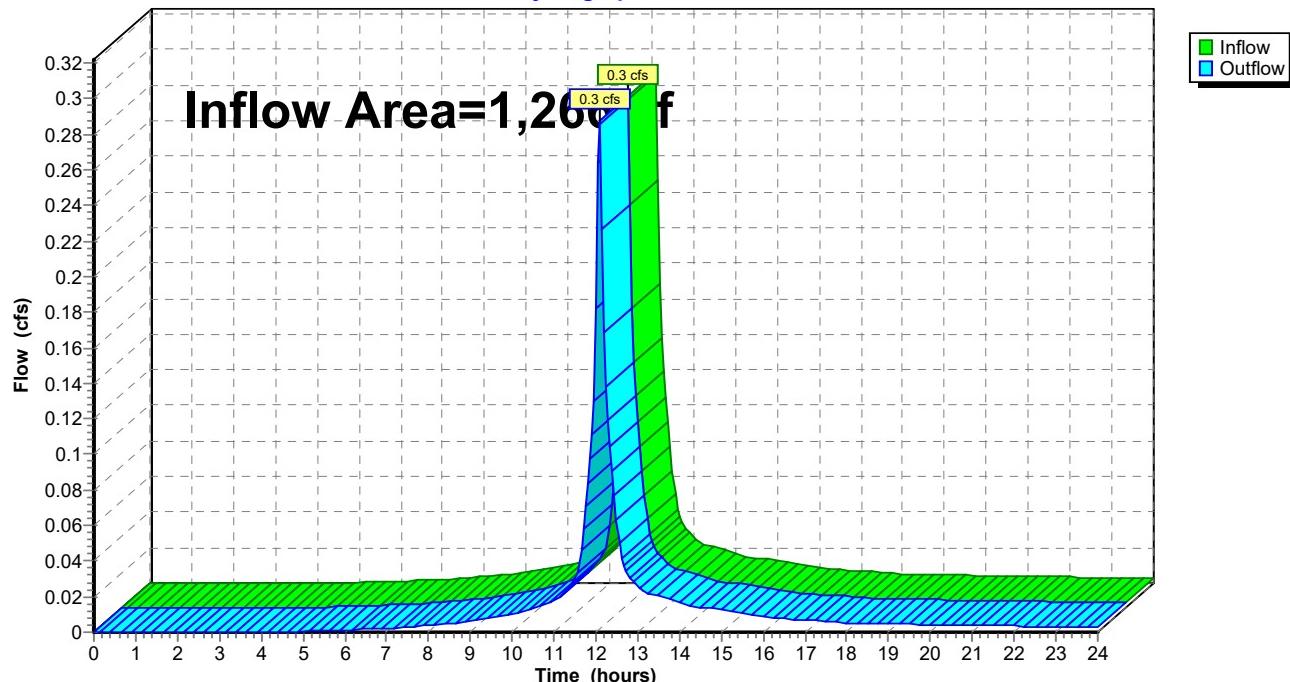
Inflow = 0.3 cfs @ 12.09 hrs, Volume= 945 cf

Outflow = 0.3 cfs @ 12.09 hrs, Volume= 945 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point 1

Hydrograph



Summary for Reach DP-2: Design Point 2

Inflow Area = 4,827 sf, 30.45% Impervious, Inflow Depth > 9.61" for 100-Yr 24 Hr event

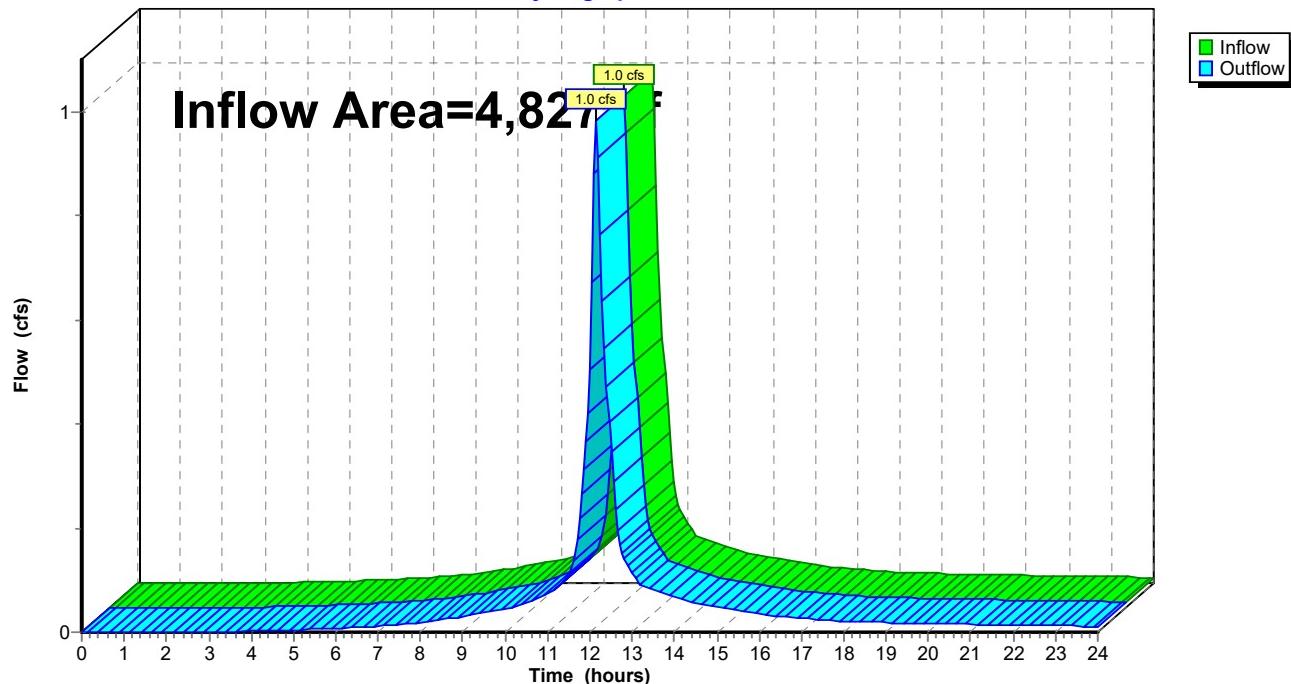
Inflow = 1.0 cfs @ 12.15 hrs, Volume= 3,865 cf

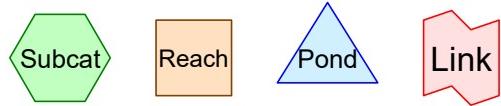
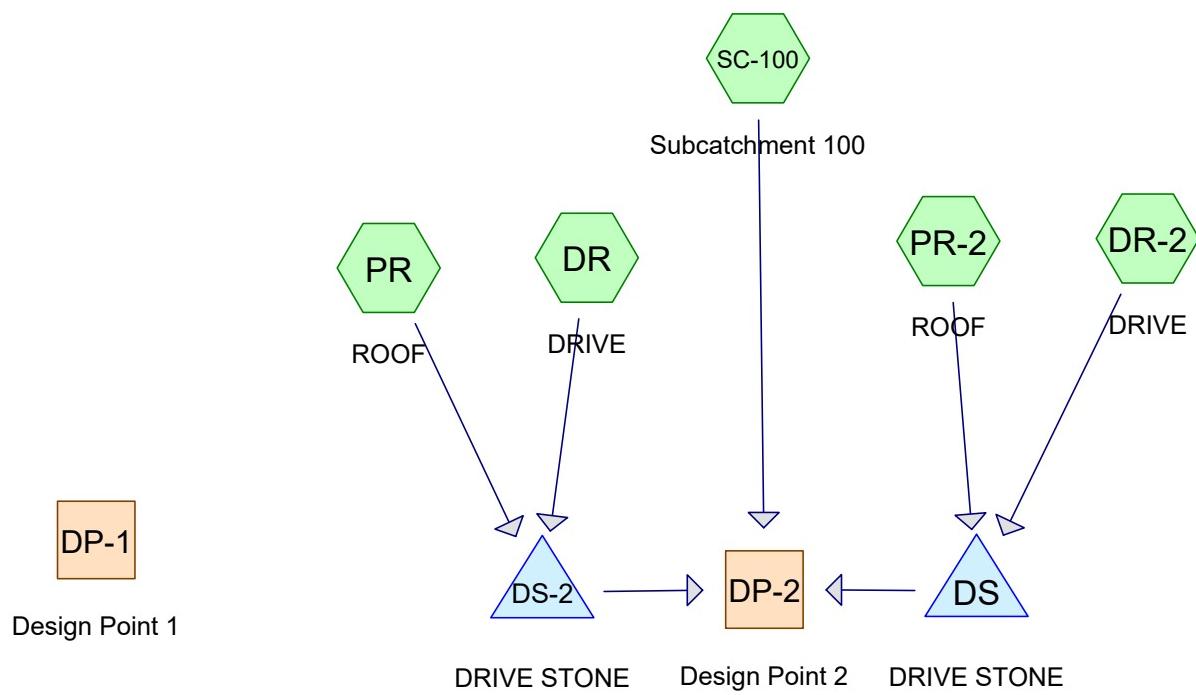
Outflow = 1.0 cfs @ 12.15 hrs, Volume= 3,865 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point 2

Hydrograph





Routing Diagram for 51 BURCH-POST
 Prepared by Patriot Engineering, Printed 12/27/2023
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51 BURCH-POST

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Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr 24 Hr	Type III 24-hr		Default	24.00	1	4.04	2
2	10-Yr 24 Hr	Type III 24-hr		Default	24.00	1	6.43	2
3	50-Yr 24 Hr	Type III 24-hr		Default	24.00	1	9.69	2
4	100-Yr 24 Hr	Type III 24-hr		Default	24.00	1	11.50	2

Summary for Subcatchment DR: DRIVE

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 214 cf, Depth> 3.80"

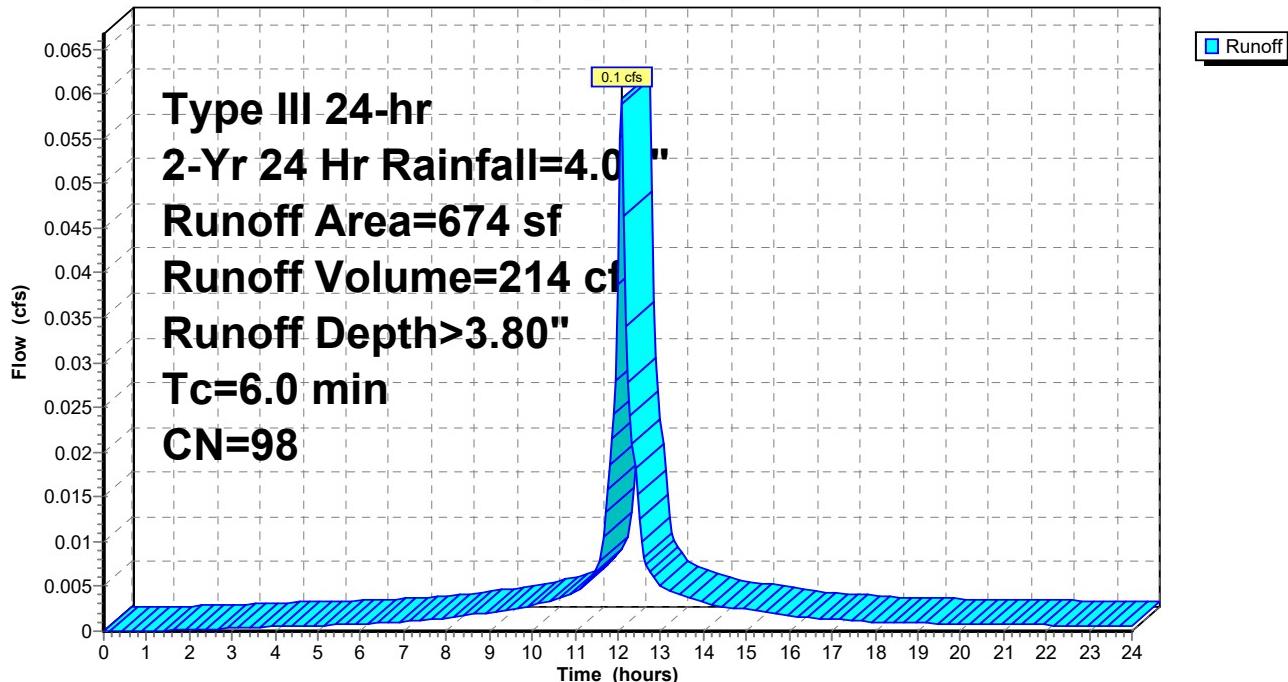
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=4.04"

Area (sf)	CN	Description
674	98	Paved parking, HSG D
674		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment DR: DRIVE

Hydrograph



Summary for Subcatchment DR-2: DRIVE

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 214 cf, Depth> 3.80"

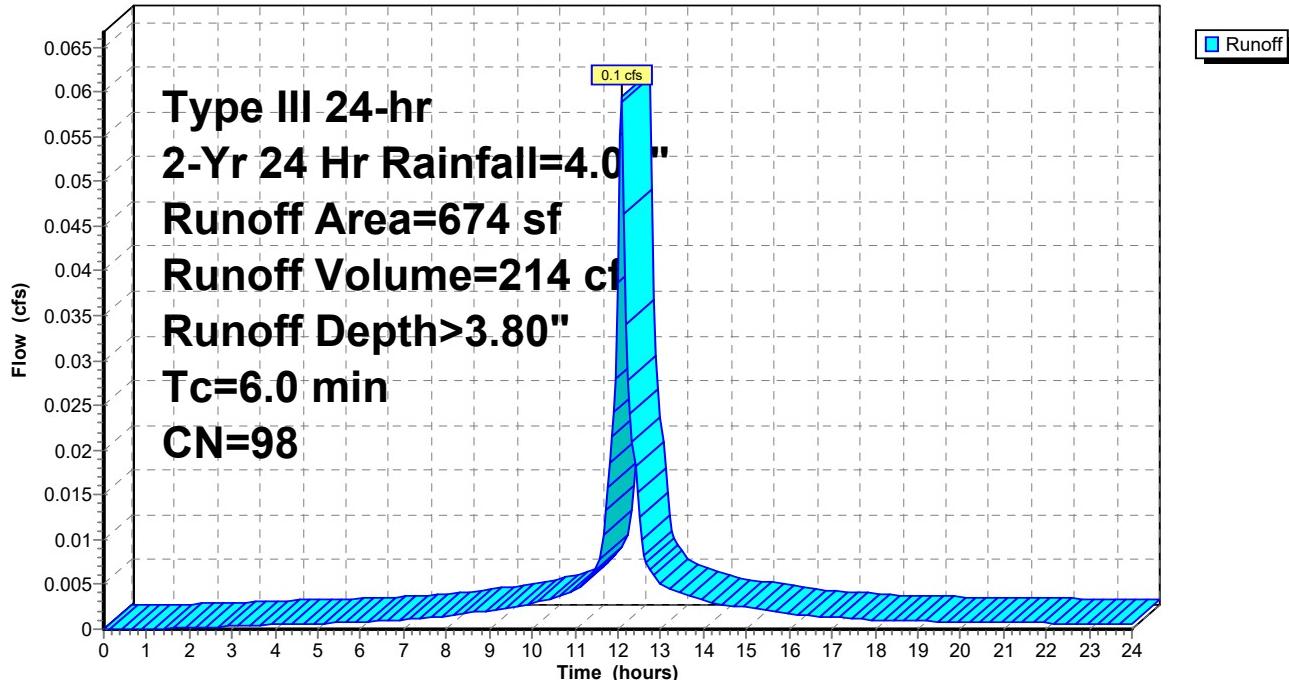
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=4.04"

Area (sf)	CN	Description
674	98	Paved parking, HSG D
674		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment DR-2: DRIVE

Hydrograph



Summary for Subcatchment PR: ROOF

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 364 cf, Depth> 3.80"

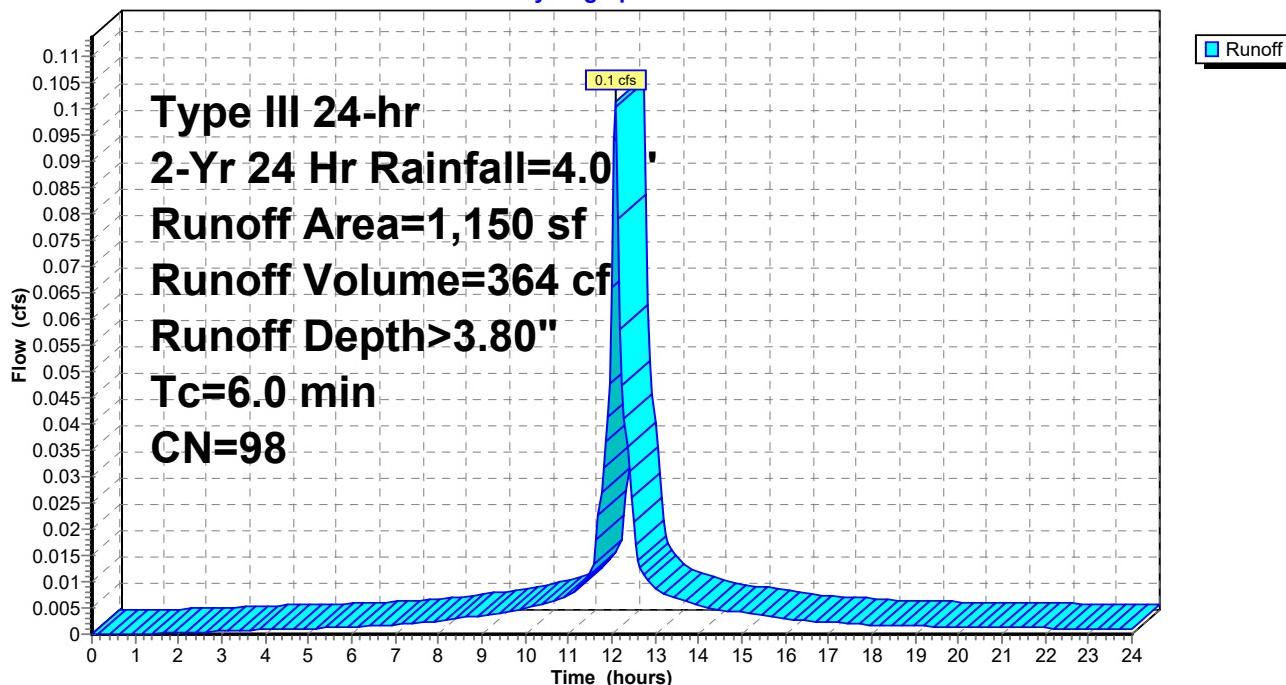
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Yr 24 Hr Rainfall=4.04"

Area (sf)	CN	Description
1,150	98	Roofs, HSG D
1,150		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry,				

Subcatchment PR: ROOF

Hydrograph



Summary for Subcatchment PR-2: ROOF

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 364 cf, Depth> 3.80"

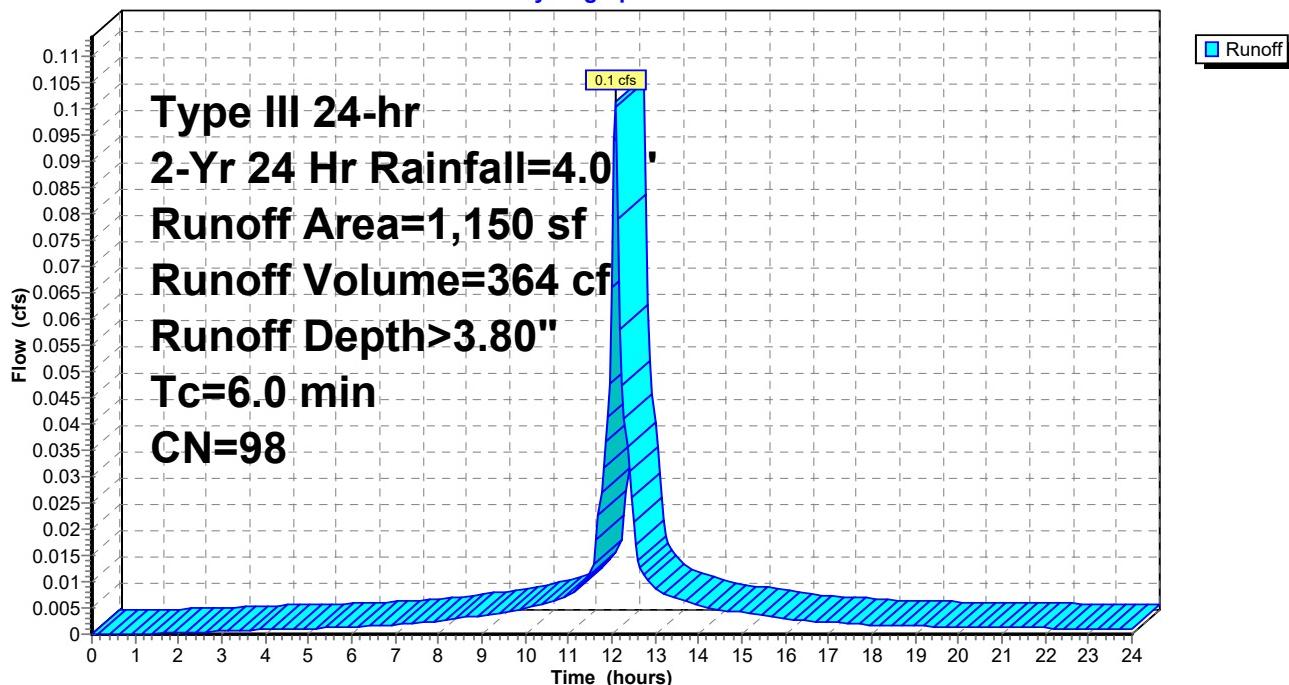
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Yr 24 Hr Rainfall=4.04"

Area (sf)	CN	Description
1,150	98	Roofs, HSG D
1,150		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry,				

Subcatchment PR-2: ROOF

Hydrograph



Summary for Subcatchment SC-100: Subcatchment 100

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 508 cf, Depth> 2.49"

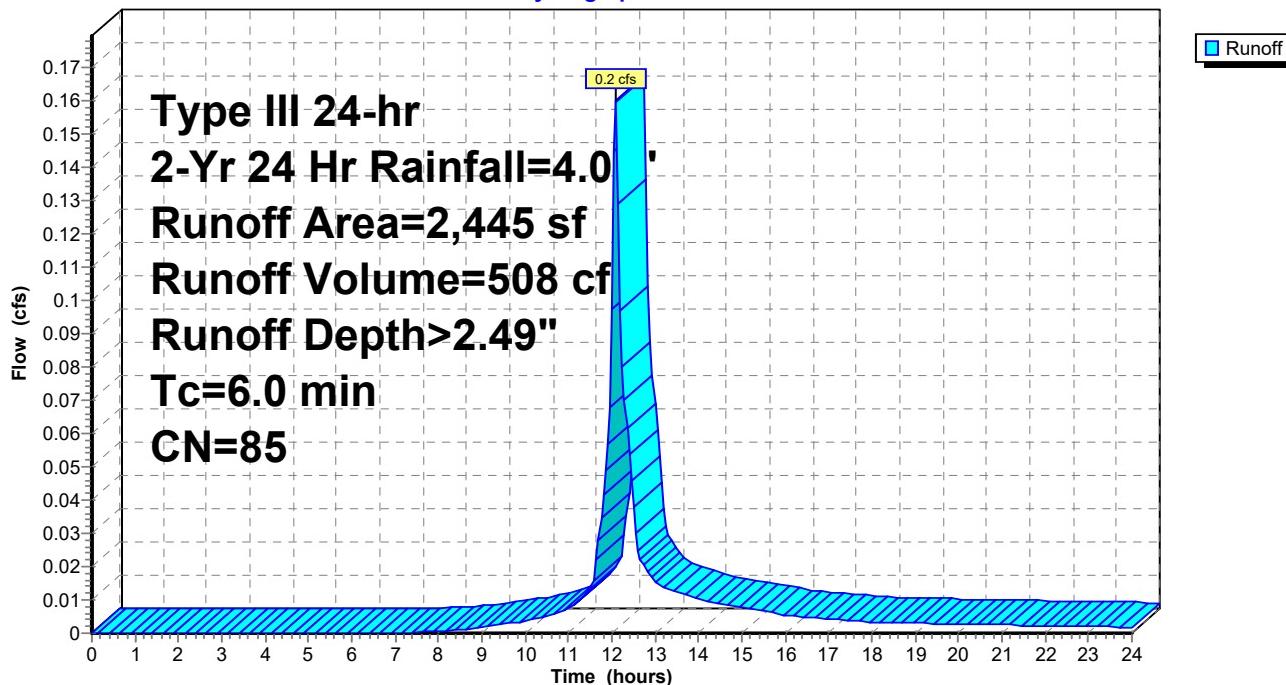
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr 24 Hr Rainfall=4.04"

Area (sf)	CN	Description
1,266	80	>75% Grass cover, Good, HSG D
515	80	>75% Grass cover, Good, HSG D
*	664	Pavers, HSG D
2,445	85	Weighted Average
1,781		72.84% Pervious Area
664		27.16% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment SC-100: Subcatchment 100

Hydrograph



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Type III 24-hr 2-Yr 24 Hr Rainfall=4.04"

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Page 8

Summary for Reach DP-1: Design Point 1

Summary for Reach DP-2: Design Point 2

Inflow Area = 6,093 sf, 70.77% Impervious, Inflow Depth > 1.00" for 2-Yr 24 Hr event

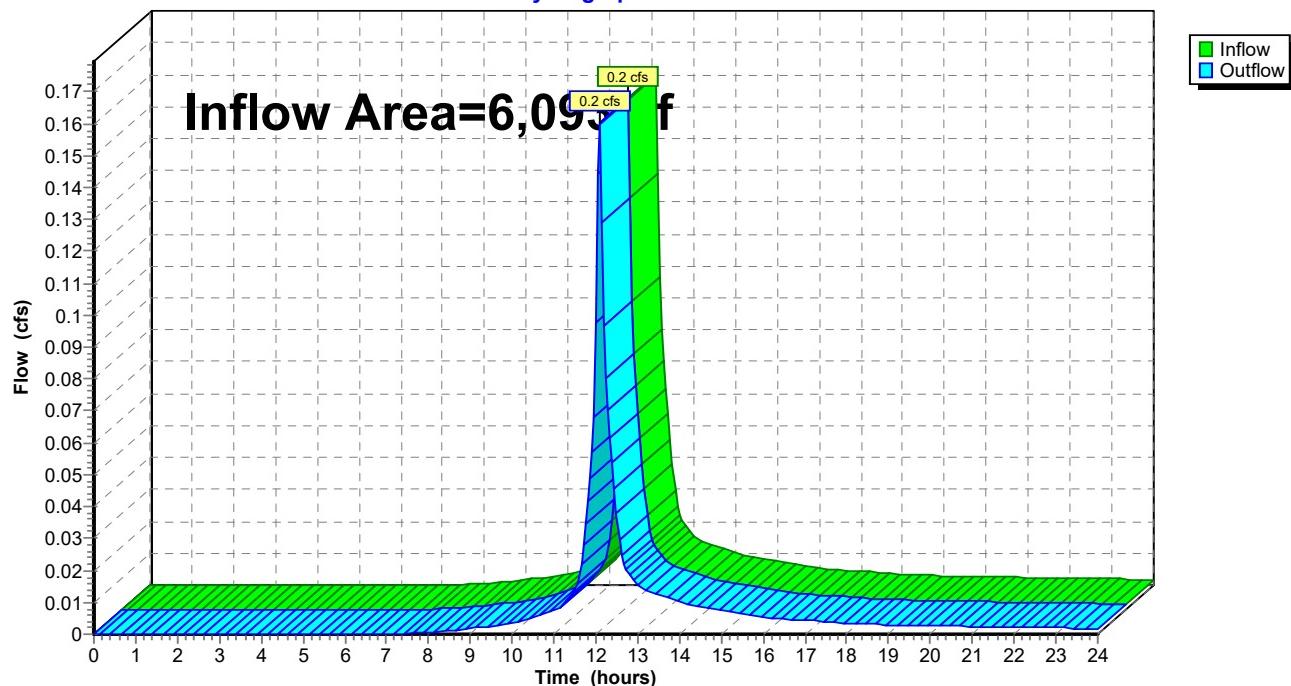
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 508 cf

Outflow = 0.2 cfs @ 12.09 hrs, Volume= 508 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point 2

Hydrograph



Summary for Pond DS: DRIVE STONE

Inflow Area = 1,824 sf, 100.00% Impervious, Inflow Depth > 3.80" for 2-Yr 24 Hr event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 578 cf
 Outflow = 0.0 cfs @ 13.18 hrs, Volume= 577 cf, Atten= 92%, Lag= 65.4 min
 Discarded = 0.0 cfs @ 13.18 hrs, Volume= 577 cf
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 0.48' @ 13.18 hrs Surf.Area= 475 sf Storage= 229 cf

Plug-Flow detention time= 150.1 min calculated for 577 cf (100% of inflow)
 Center-of-Mass det. time= 148.6 min (900.0 - 751.3)

Volume	Invert	Avail.Storage	Storage Description	
#1	0.00'	950 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
0.00	475	0	0	475
2.00	475	950	950	630

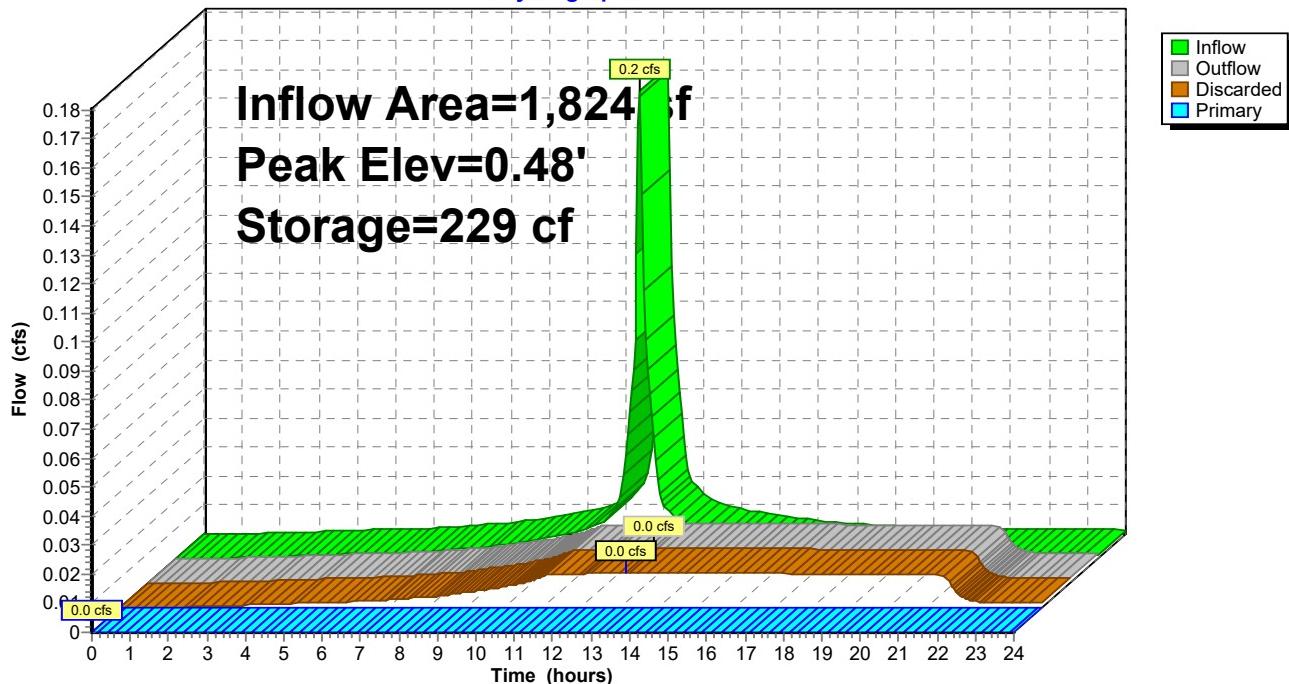
Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	1.90'	8.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.0 cfs @ 13.18 hrs HW=0.48' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=0.00' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond DS: DRIVE STONE**Hydrograph**

Summary for Pond DS-2: DRIVE STONE

Inflow Area = 1,824 sf, 100.00% Impervious, Inflow Depth > 3.80" for 2-Yr 24 Hr event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 578 cf
 Outflow = 0.0 cfs @ 13.18 hrs, Volume= 577 cf, Atten= 92%, Lag= 65.4 min
 Discarded = 0.0 cfs @ 13.18 hrs, Volume= 577 cf
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 0.48' @ 13.18 hrs Surf.Area= 475 sf Storage= 229 cf

Plug-Flow detention time= 150.1 min calculated for 577 cf (100% of inflow)

Center-of-Mass det. time= 148.6 min (900.0 - 751.3)

Volume	Invert	Avail.Storage	Storage Description	
#1	0.00'	950 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
0.00	475	0	0	475
2.00	475	950	950	630

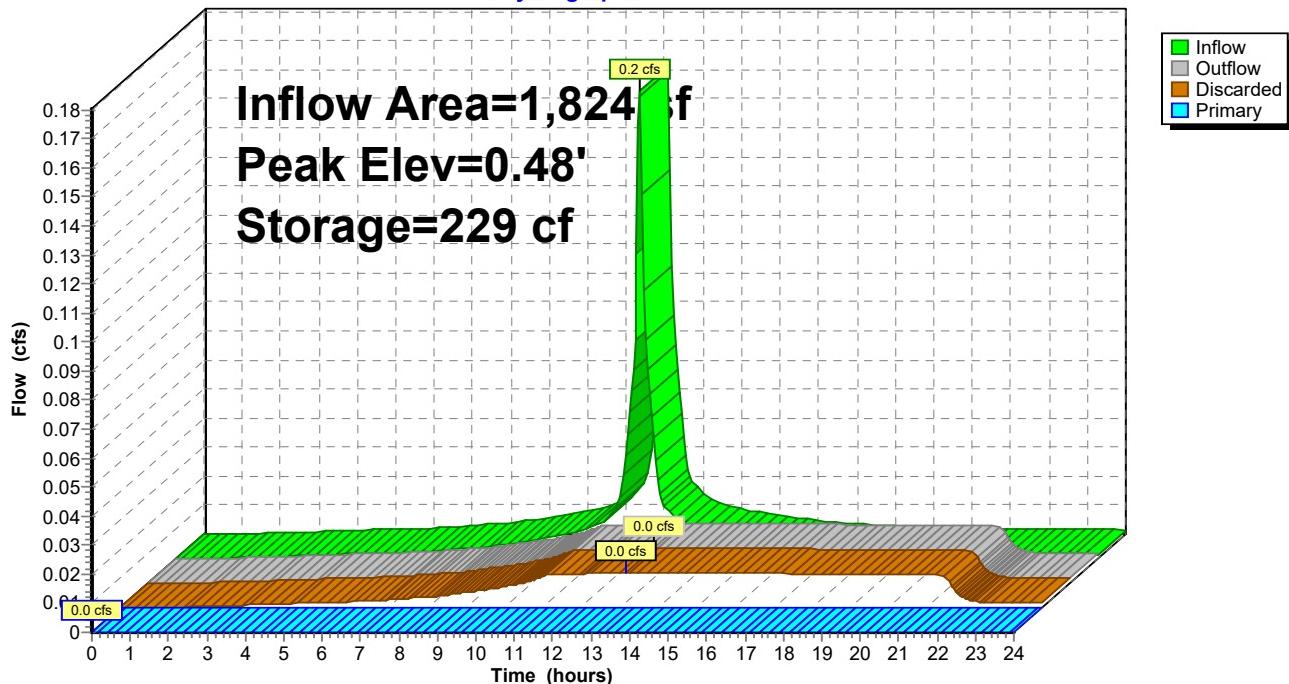
Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	1.90'	8.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.0 cfs @ 13.18 hrs HW=0.48' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=0.00' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond DS-2: DRIVE STONE**Hydrograph**

Summary for Subcatchment DR: DRIVE

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 348 cf, Depth> 6.19"

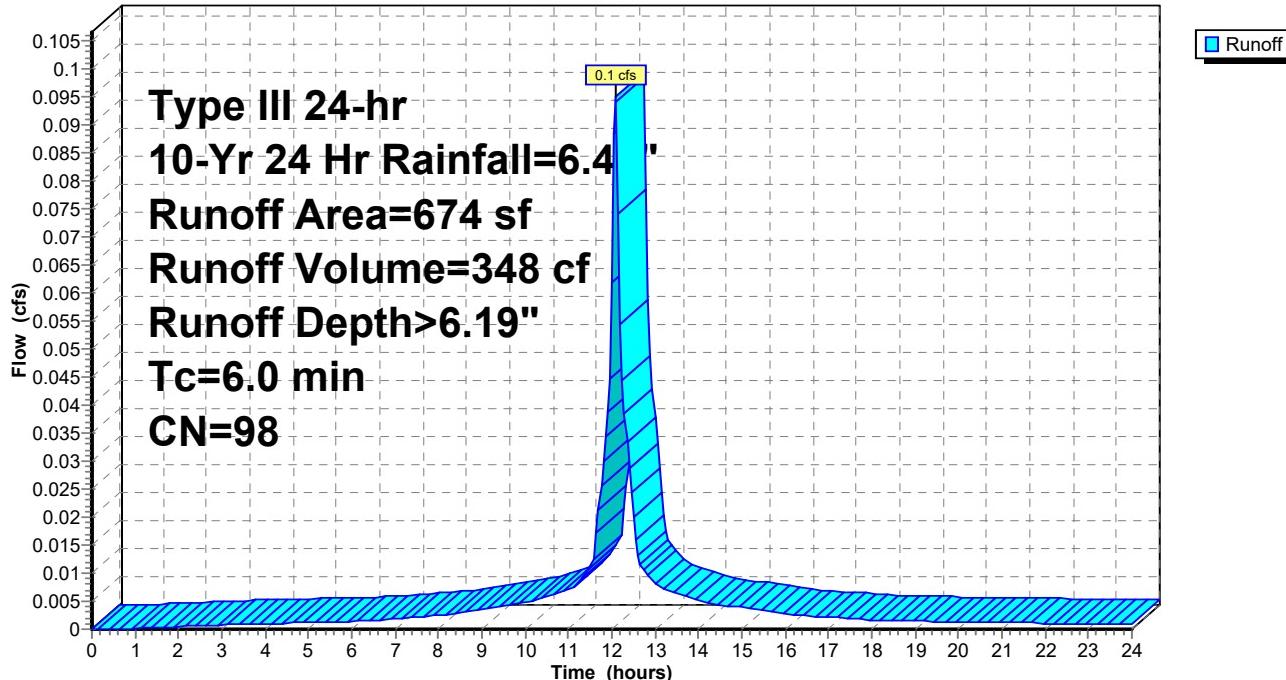
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Yr 24 Hr Rainfall=6.43"

Area (sf)	CN	Description
674	98	Paved parking, HSG D
674		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment DR: DRIVE

Hydrograph



Summary for Subcatchment DR-2: DRIVE

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 348 cf, Depth> 6.19"

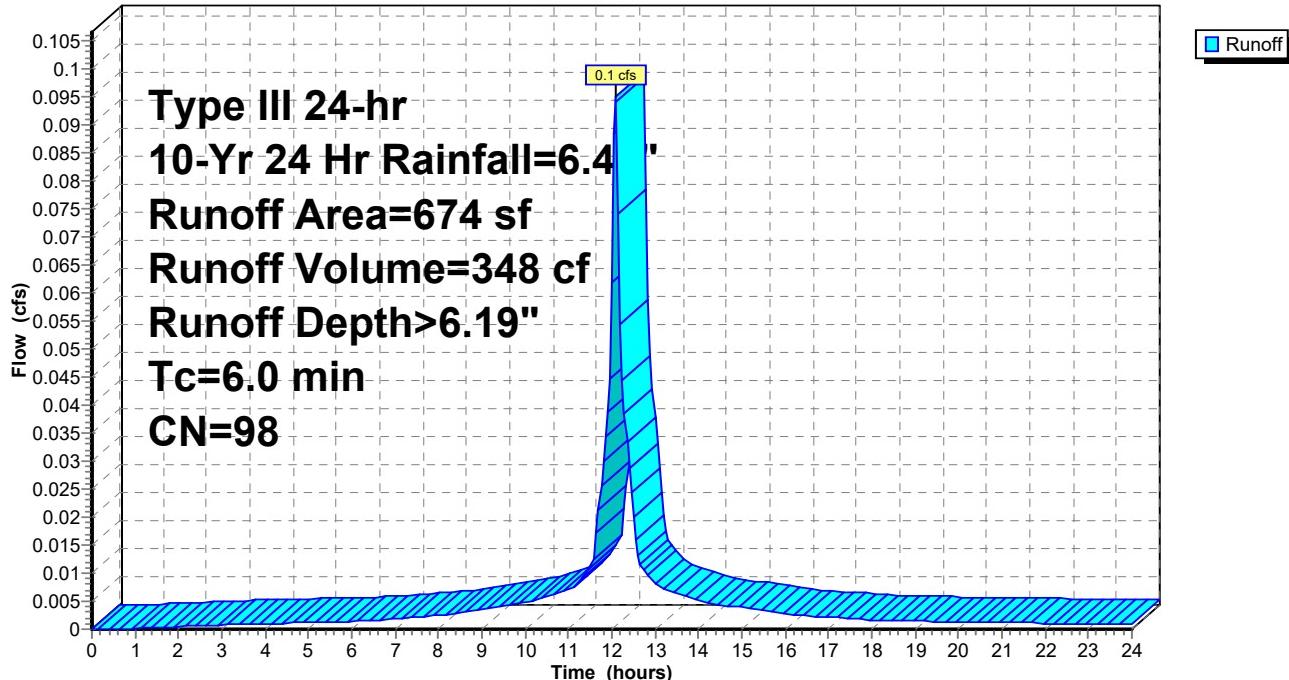
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=6.43"

Area (sf)	CN	Description
674	98	Paved parking, HSG D
674		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment DR-2: DRIVE

Hydrograph



Summary for Subcatchment PR: ROOF

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 593 cf, Depth> 6.19"

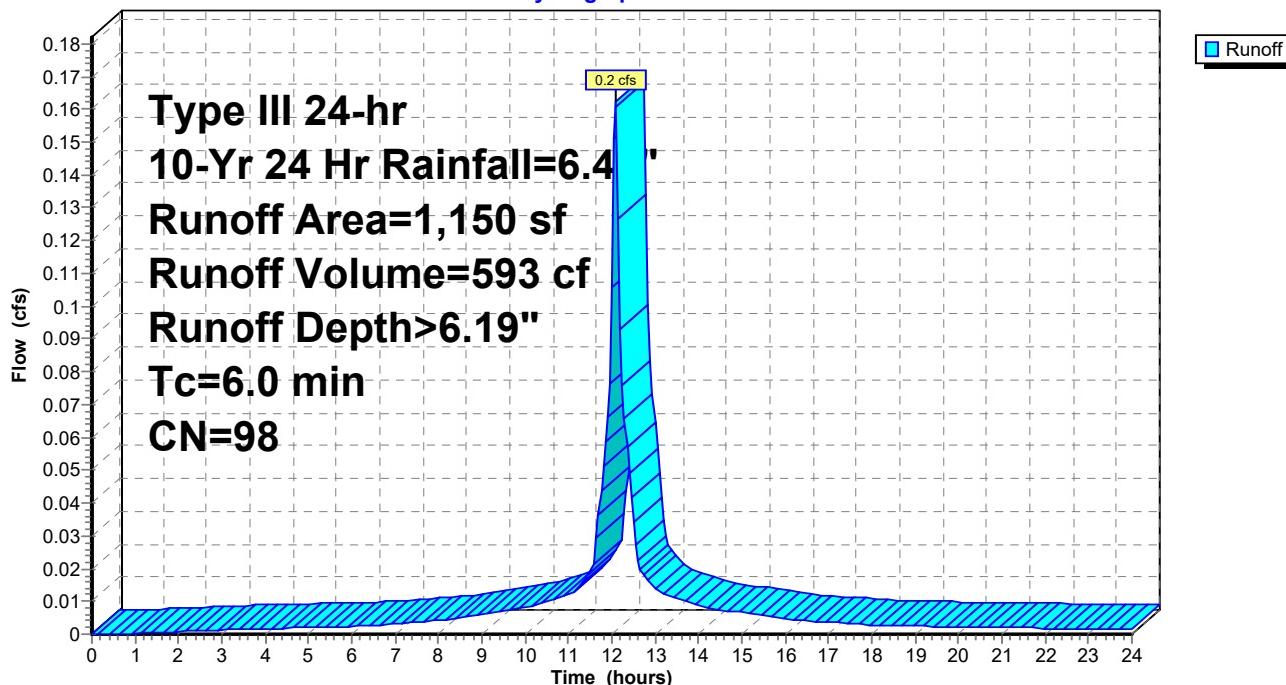
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr 24 Hr Rainfall=6.43"

Area (sf)	CN	Description
1,150	98	Roofs, HSG D
1,150		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry,				

Subcatchment PR: ROOF

Hydrograph



Summary for Subcatchment PR-2: ROOF

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 593 cf, Depth> 6.19"

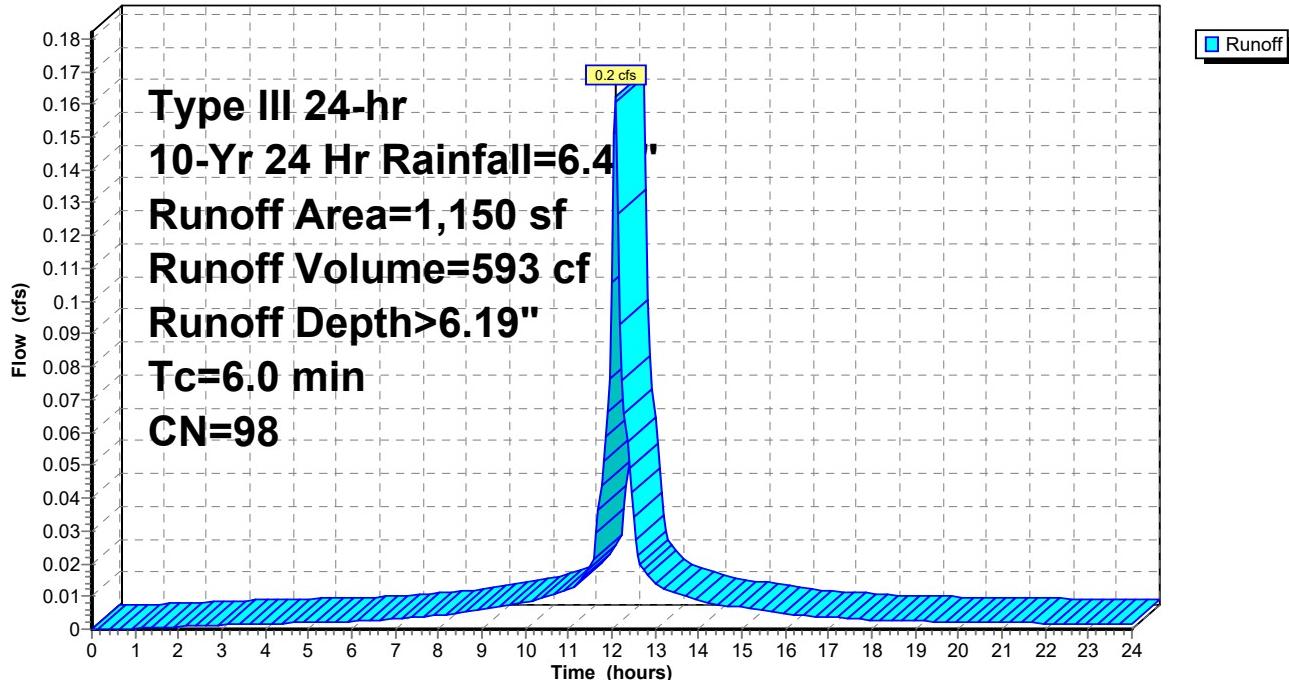
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Yr 24 Hr Rainfall=6.43"

Area (sf)	CN	Description
1,150	98	Roofs, HSG D
1,150		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry,				

Subcatchment PR-2: ROOF

Hydrograph



Summary for Subcatchment SC-100: Subcatchment 100

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 959 cf, Depth> 4.71"

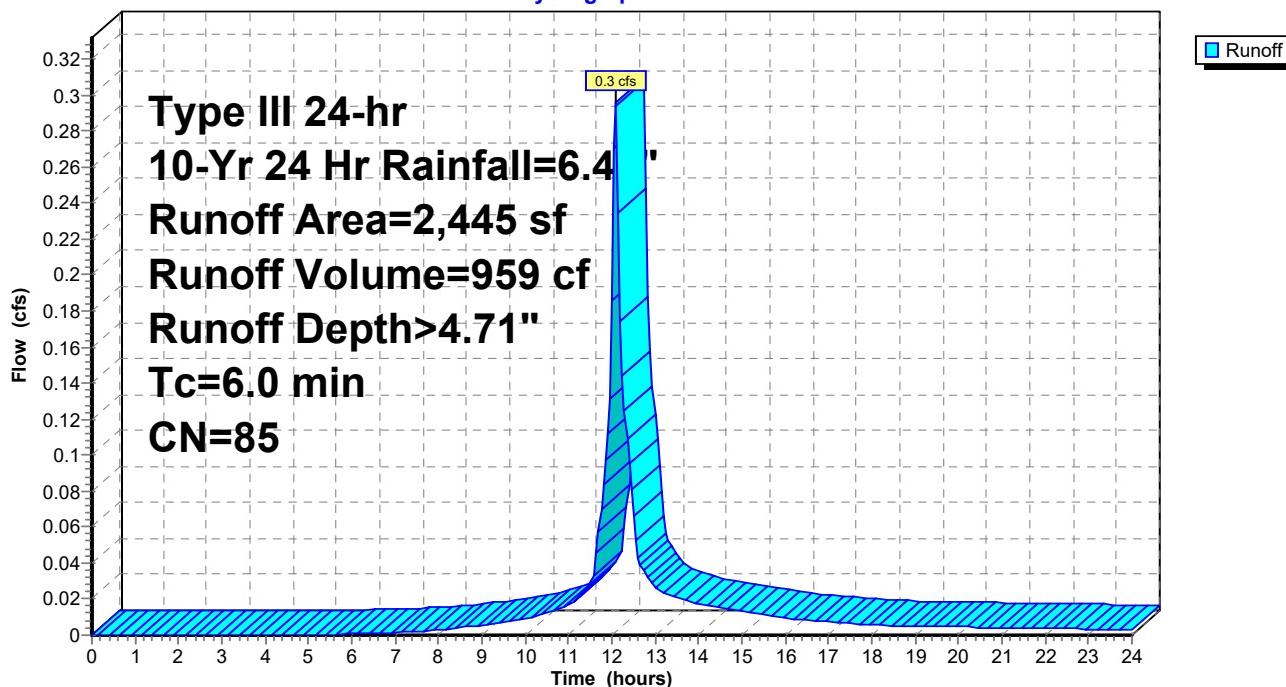
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Yr 24 Hr Rainfall=6.43"

Area (sf)	CN	Description
1,266	80	>75% Grass cover, Good, HSG D
515	80	>75% Grass cover, Good, HSG D
*	664	Pavers, HSG D
2,445	85	Weighted Average
1,781		72.84% Pervious Area
664		27.16% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment SC-100: Subcatchment 100

Hydrograph



51 BURCH-POST

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Type III 24-hr 10-Yr 24 Hr Rainfall=6.43"

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Page 19

Summary for Reach DP-1: Design Point 1

Summary for Reach DP-2: Design Point 2

Inflow Area = 6,093 sf, 70.77% Impervious, Inflow Depth > 1.89" for 10-Yr 24 Hr event

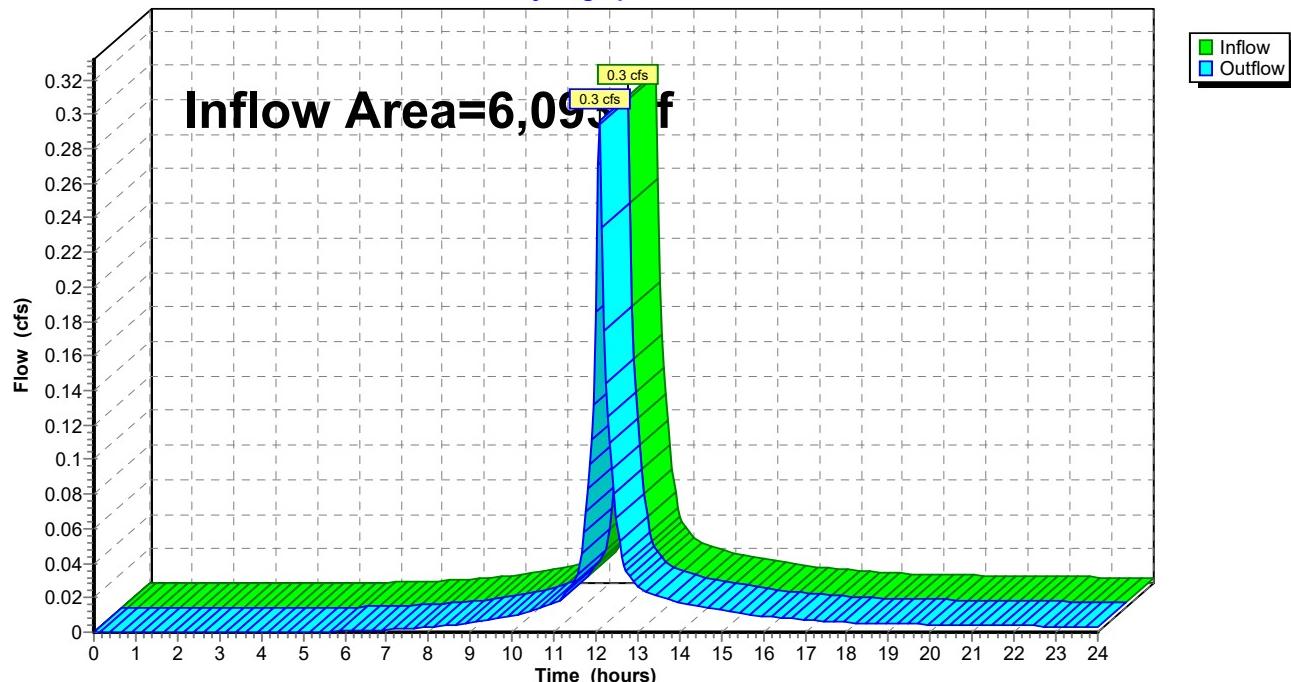
Inflow = 0.3 cfs @ 12.09 hrs, Volume= 959 cf

Outflow = 0.3 cfs @ 12.09 hrs, Volume= 959 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point 2

Hydrograph



Summary for Pond DS: DRIVE STONE

Inflow Area = 1,824 sf, 100.00% Impervious, Inflow Depth > 6.19" for 10-Yr 24 Hr event
 Inflow = 0.3 cfs @ 12.09 hrs, Volume= 941 cf
 Outflow = 0.0 cfs @ 14.21 hrs, Volume= 762 cf, Atten= 95%, Lag= 127.7 min
 Discarded = 0.0 cfs @ 14.21 hrs, Volume= 762 cf
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 0.93' @ 14.21 hrs Surf.Area= 475 sf Storage= 441 cf

Plug-Flow detention time= 246.0 min calculated for 760 cf (81% of inflow)

Center-of-Mass det. time= 171.7 min (915.4 - 743.7)

Volume	Invert	Avail.Storage	Storage Description	
#1	0.00'	950 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
0.00	475	0	0	475
2.00	475	950	950	630

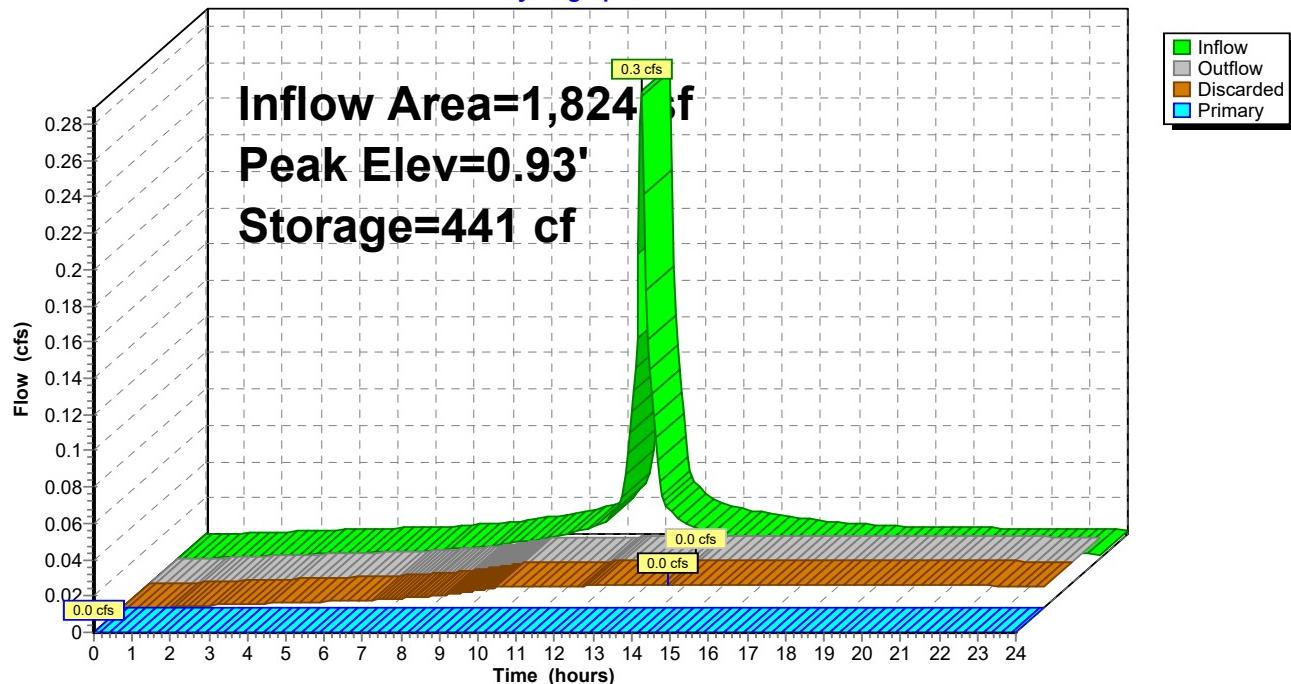
Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	1.90'	8.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.0 cfs @ 14.21 hrs HW=0.93' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=0.00' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond DS: DRIVE STONE**Hydrograph**

Summary for Pond DS-2: DRIVE STONE

Inflow Area = 1,824 sf, 100.00% Impervious, Inflow Depth > 6.19" for 10-Yr 24 Hr event
 Inflow = 0.3 cfs @ 12.09 hrs, Volume= 941 cf
 Outflow = 0.0 cfs @ 14.21 hrs, Volume= 762 cf, Atten= 95%, Lag= 127.7 min
 Discarded = 0.0 cfs @ 14.21 hrs, Volume= 762 cf
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 0.93' @ 14.21 hrs Surf.Area= 475 sf Storage= 441 cf

Plug-Flow detention time= 246.0 min calculated for 760 cf (81% of inflow)
 Center-of-Mass det. time= 171.7 min (915.4 - 743.7)

Volume	Invert	Avail.Storage	Storage Description	
#1	0.00'	950 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
0.00	475	0	0	475
2.00	475	950	950	630

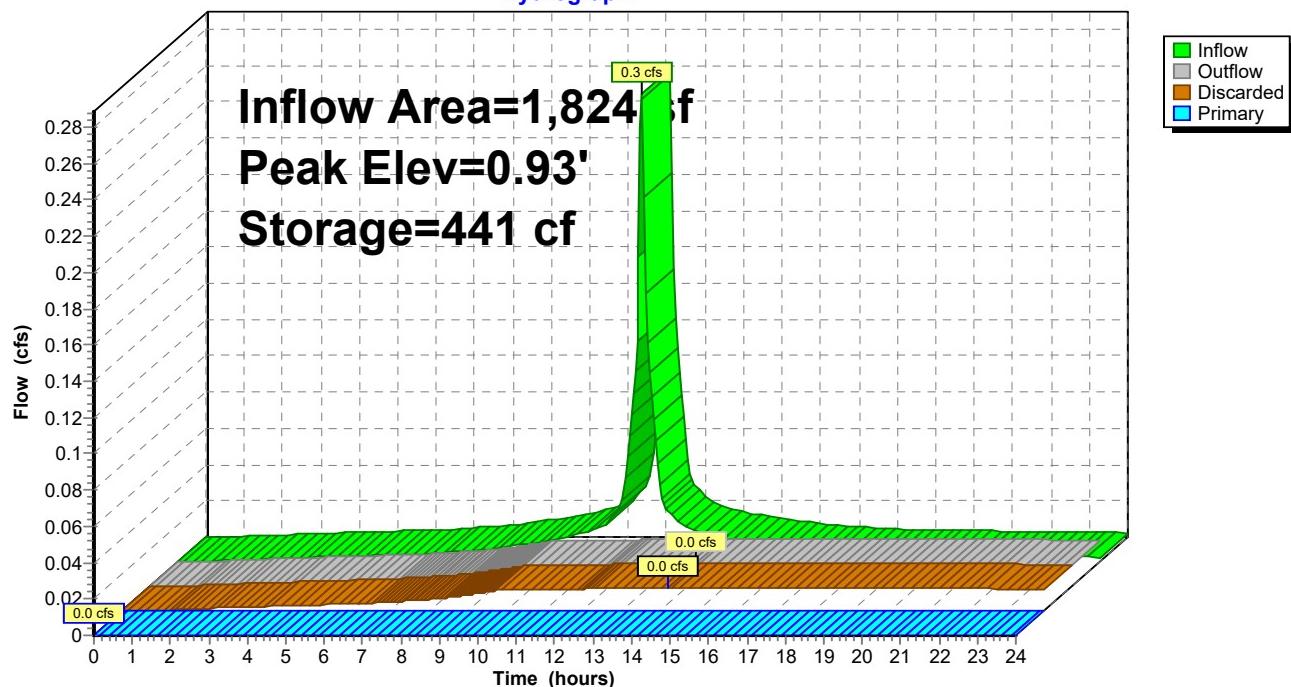
Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	1.90'	8.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.0 cfs @ 14.21 hrs HW=0.93' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=0.00' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond DS-2: DRIVE STONE**Hydrograph**

Summary for Subcatchment DR: DRIVE

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 530 cf, Depth> 9.44"

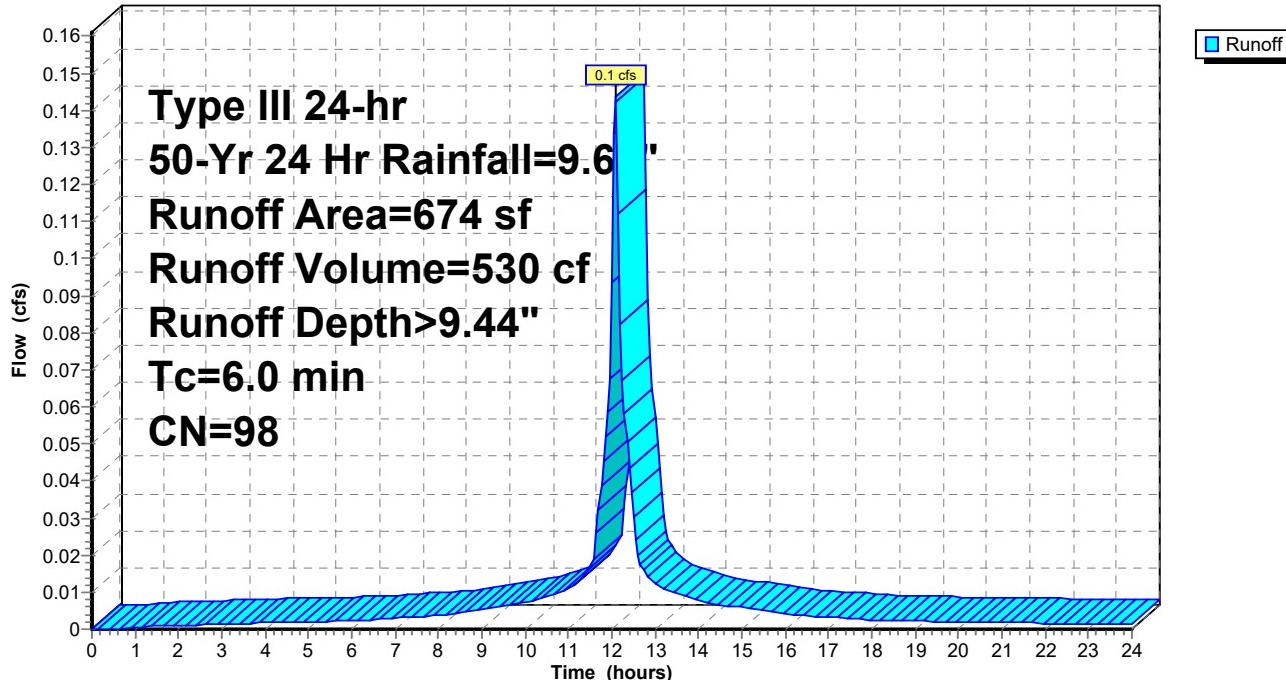
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 50-Yr 24 Hr Rainfall=9.69"

Area (sf)	CN	Description
674	98	Paved parking, HSG D
674		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment DR: DRIVE

Hydrograph



Summary for Subcatchment DR-2: DRIVE

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 530 cf, Depth> 9.44"

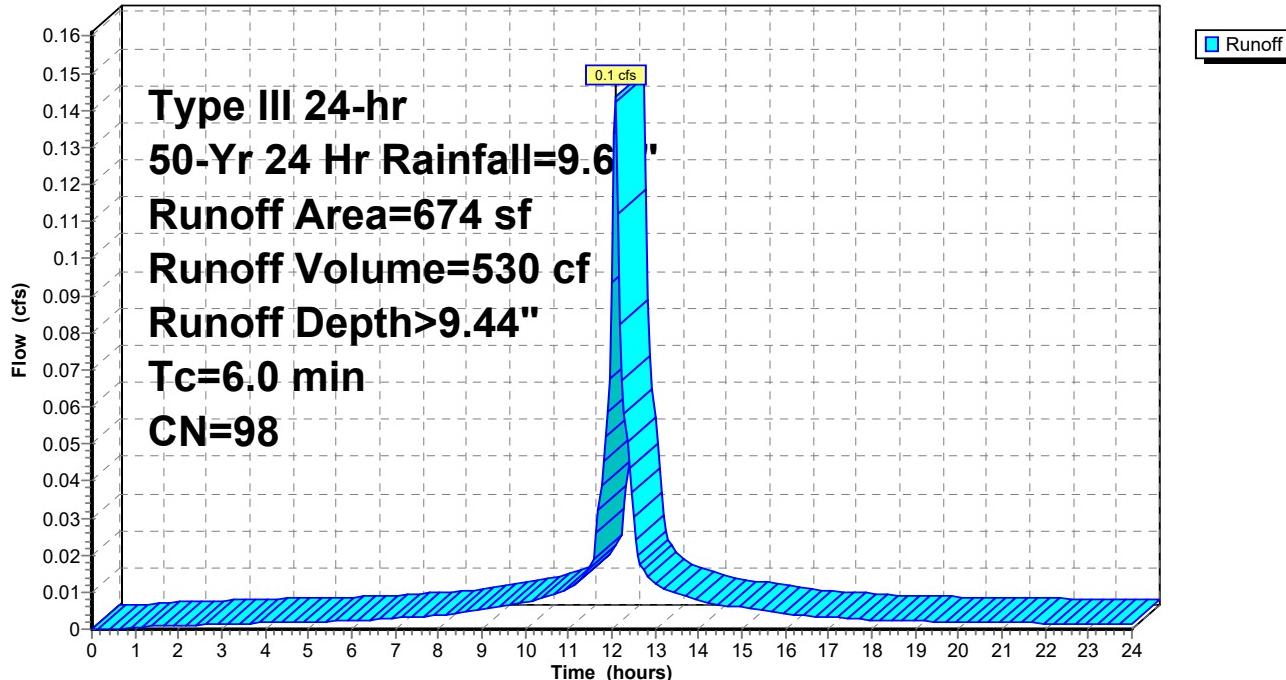
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 50-Yr 24 Hr Rainfall=9.69"

Area (sf)	CN	Description
674	98	Paved parking, HSG D
674		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment DR-2: DRIVE

Hydrograph



Summary for Subcatchment PR: ROOF

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 905 cf, Depth> 9.44"

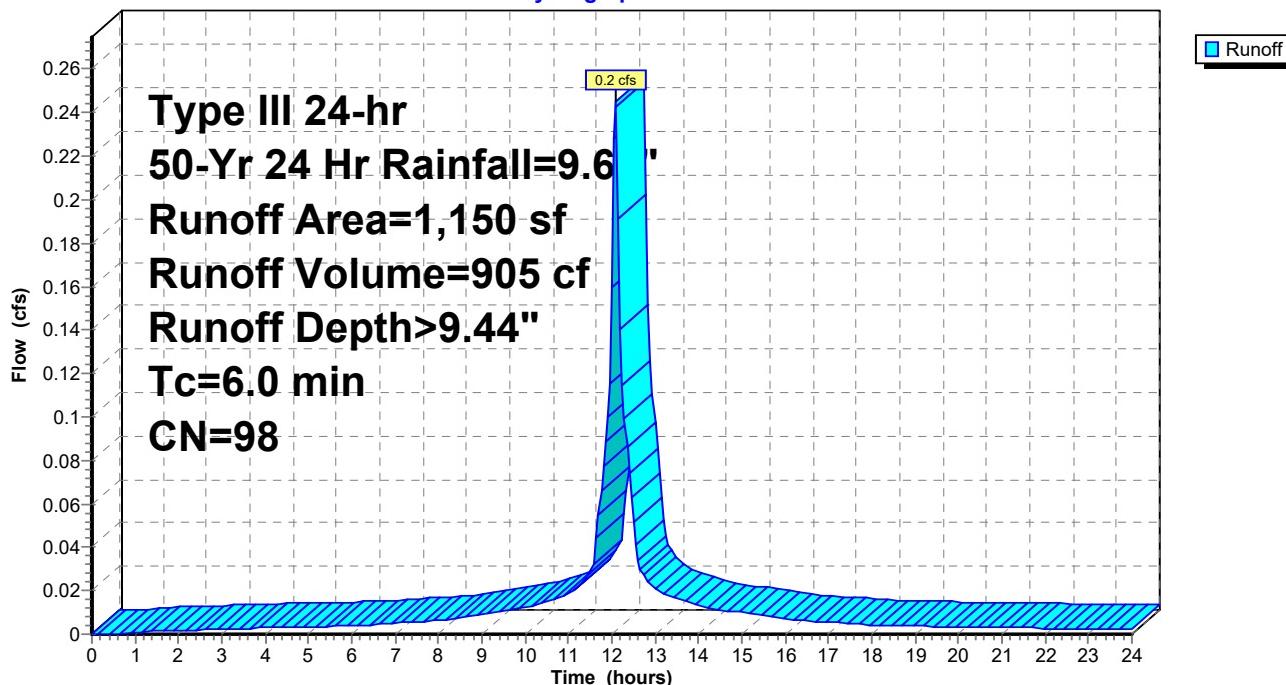
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 50-Yr 24 Hr Rainfall=9.69"

Area (sf)	CN	Description
1,150	98	Roofs, HSG D
1,150		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry,				

Subcatchment PR: ROOF

Hydrograph



Summary for Subcatchment PR-2: ROOF

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 905 cf, Depth> 9.44"

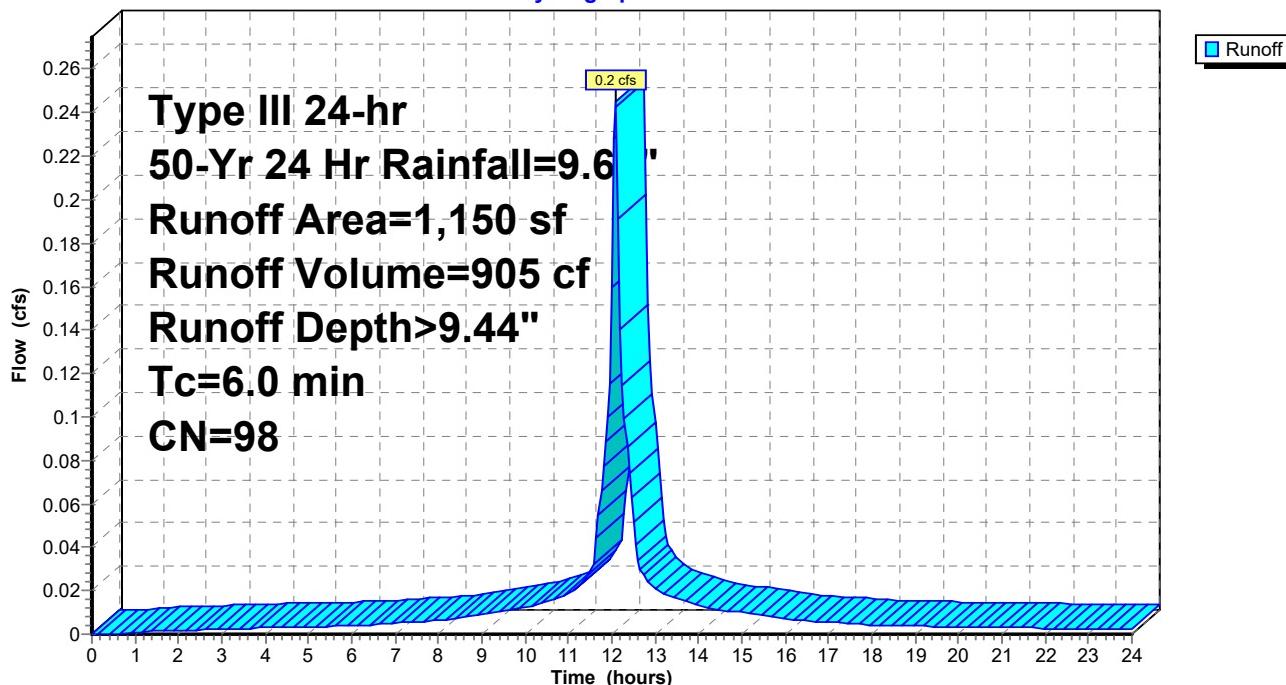
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 50-Yr 24 Hr Rainfall=9.69"

Area (sf)	CN	Description
1,150	98	Roofs, HSG D
1,150		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry,				

Subcatchment PR-2: ROOF

Hydrograph



Summary for Subcatchment SC-100: Subcatchment 100

Runoff = 0.5 cfs @ 12.09 hrs, Volume= 1,599 cf, Depth> 7.85"

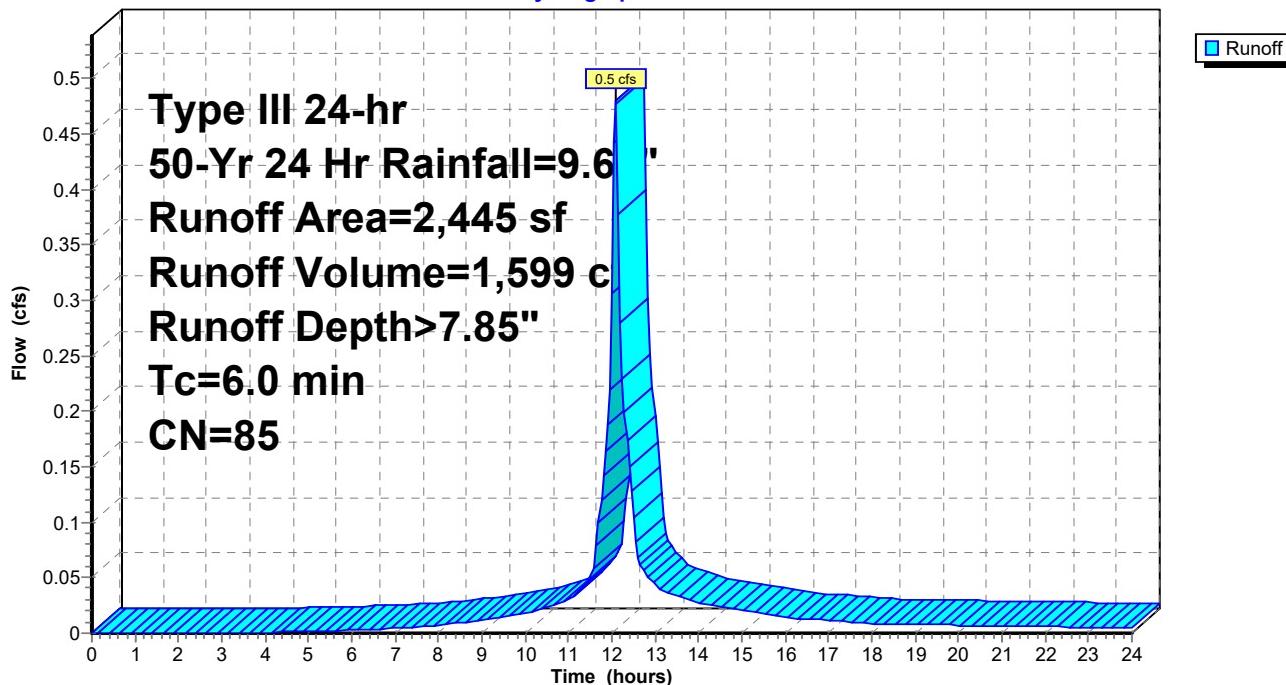
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 50-Yr 24 Hr Rainfall=9.69"

Area (sf)	CN	Description
1,266	80	>75% Grass cover, Good, HSG D
515	80	>75% Grass cover, Good, HSG D
*	664	Pavers, HSG D
2,445	85	Weighted Average
1,781		72.84% Pervious Area
664		27.16% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment SC-100: Subcatchment 100

Hydrograph



51 BURCH-POST

Prepared by Patriot Engineering

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Type III 24-hr 50-Yr 24 Hr Rainfall=9.69"

Printed 12/27/2023

Page 30

Summary for Reach DP-1: Design Point 1

Summary for Reach DP-2: Design Point 2

Inflow Area = 6,093 sf, 70.77% Impervious, Inflow Depth > 3.15" for 50-Yr 24 Hr event

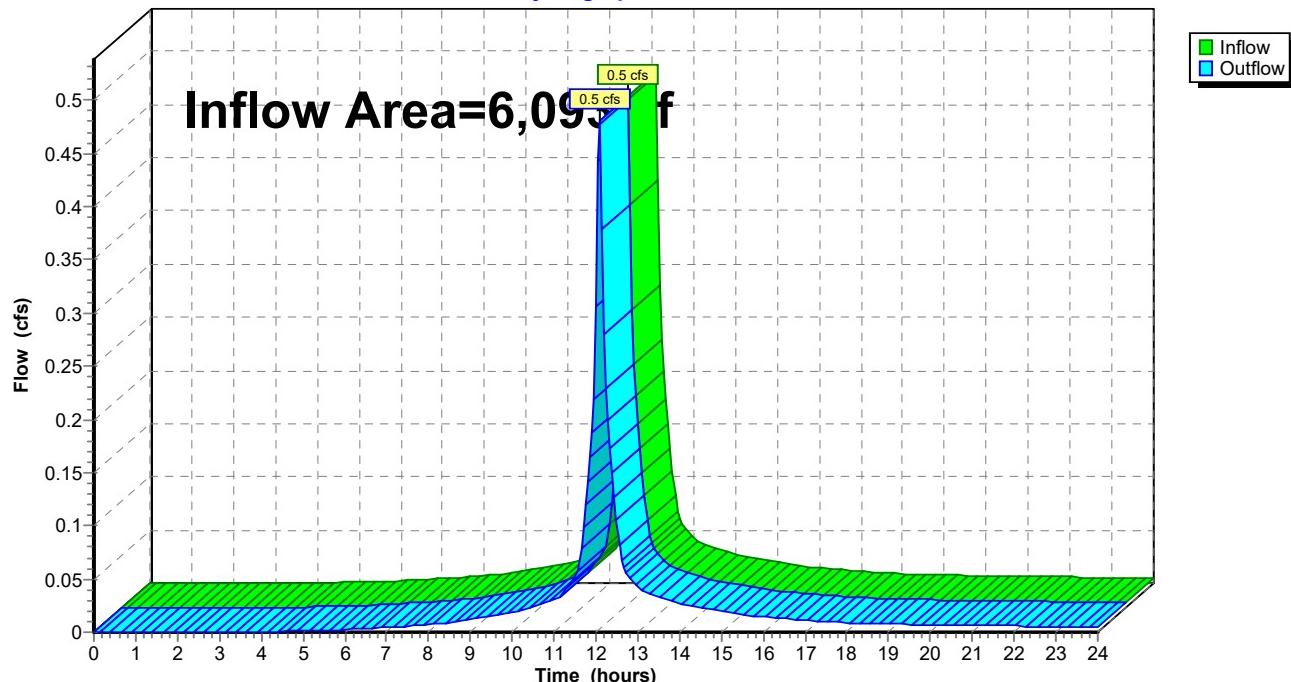
Inflow = 0.5 cfs @ 12.09 hrs, Volume= 1,599 cf

Outflow = 0.5 cfs @ 12.09 hrs, Volume= 1,599 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point 2

Hydrograph



Summary for Pond DS: DRIVE STONE

Inflow Area = 1,824 sf, 100.00% Impervious, Inflow Depth > 9.44" for 50-Yr 24 Hr event
 Inflow = 0.4 cfs @ 12.09 hrs, Volume= 1,435 cf
 Outflow = 0.0 cfs @ 15.33 hrs, Volume= 888 cf, Atten= 96%, Lag= 194.7 min
 Discarded = 0.0 cfs @ 15.33 hrs, Volume= 888 cf
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 1.64' @ 15.33 hrs Surf.Area= 475 sf Storage= 780 cf

Plug-Flow detention time= 257.1 min calculated for 888 cf (62% of inflow)
 Center-of-Mass det. time= 146.5 min (885.1 - 738.6)

Volume	Invert	Avail.Storage	Storage Description	
#1	0.00'	950 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
0.00	475	0	0	475
2.00	475	950	950	630

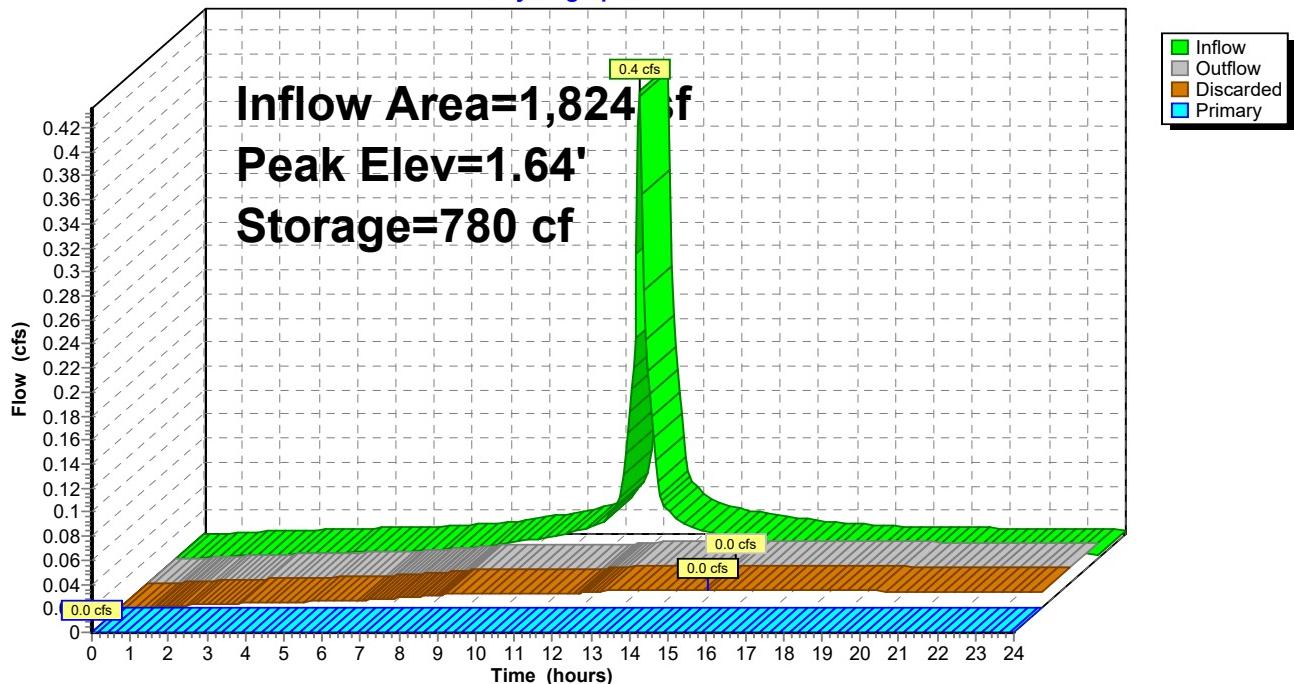
Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	1.90'	8.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.0 cfs @ 15.33 hrs HW=1.64' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=0.00' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond DS: DRIVE STONE**Hydrograph**

Summary for Pond DS-2: DRIVE STONE

Inflow Area = 1,824 sf, 100.00% Impervious, Inflow Depth > 9.44" for 50-Yr 24 Hr event
 Inflow = 0.4 cfs @ 12.09 hrs, Volume= 1,435 cf
 Outflow = 0.0 cfs @ 15.33 hrs, Volume= 888 cf, Atten= 96%, Lag= 194.7 min
 Discarded = 0.0 cfs @ 15.33 hrs, Volume= 888 cf
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 1.64' @ 15.33 hrs Surf.Area= 475 sf Storage= 780 cf

Plug-Flow detention time= 257.1 min calculated for 888 cf (62% of inflow)
 Center-of-Mass det. time= 146.5 min (885.1 - 738.6)

Volume	Invert	Avail.Storage	Storage Description	
#1	0.00'	950 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
0.00	475	0	0	475
2.00	475	950	950	630

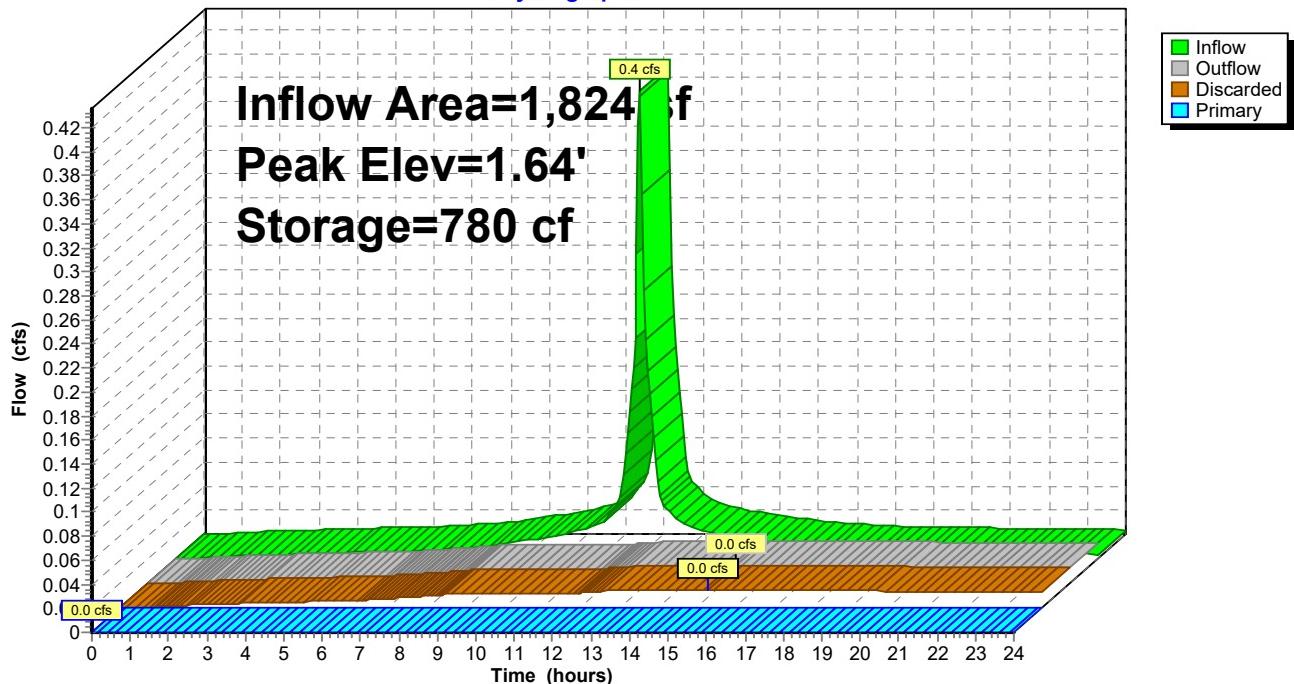
Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	1.90'	8.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.0 cfs @ 15.33 hrs HW=1.64' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=0.00' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond DS-2: DRIVE STONE**Hydrograph**

Summary for Subcatchment DR: DRIVE

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 632 cf, Depth>11.25"

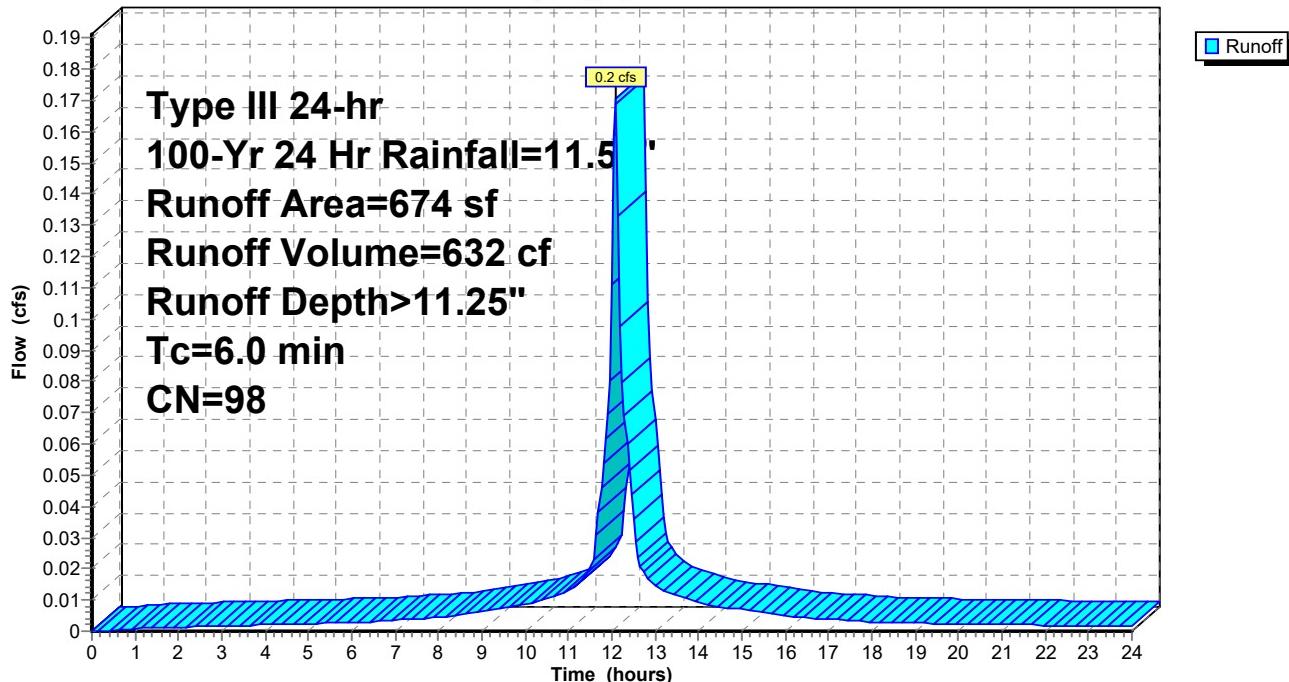
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=11.50"

Area (sf)	CN	Description
674	98	Paved parking, HSG D
674		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment DR: DRIVE

Hydrograph



Summary for Subcatchment DR-2: DRIVE

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 632 cf, Depth>11.25"

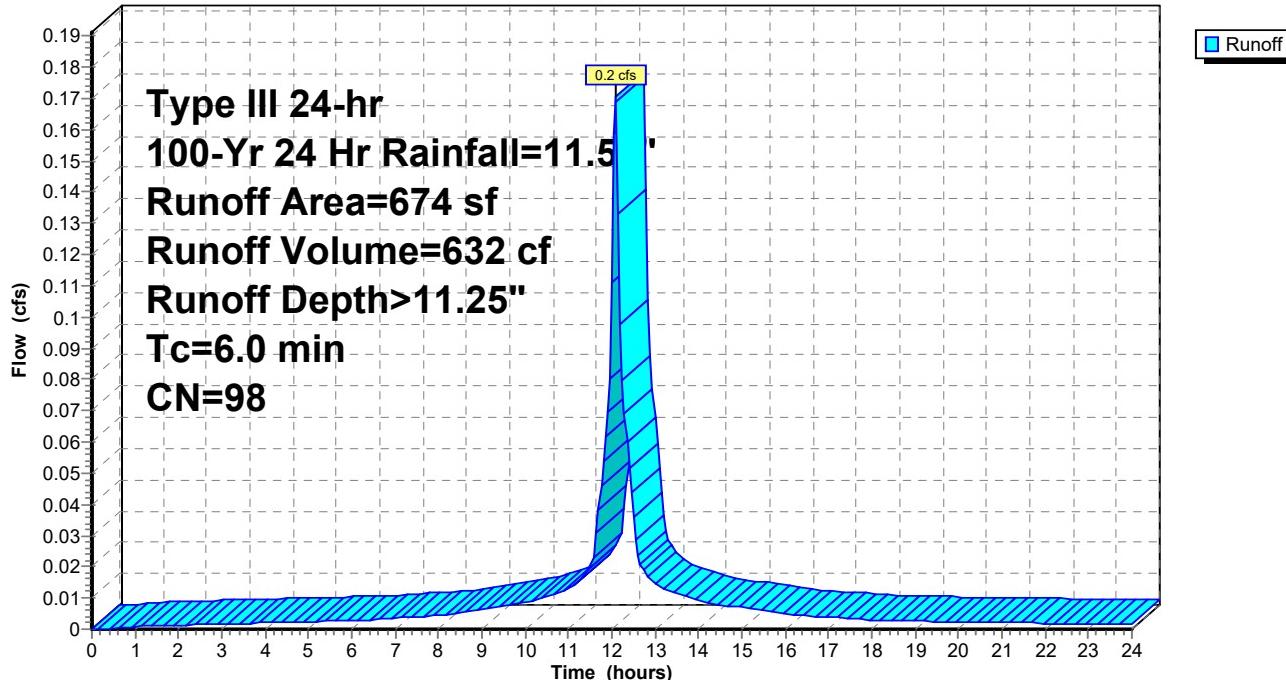
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=11.50"

Area (sf)	CN	Description
674	98	Paved parking, HSG D
674		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment DR-2: DRIVE

Hydrograph



Summary for Subcatchment PR: ROOF

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,078 cf, Depth>11.25"

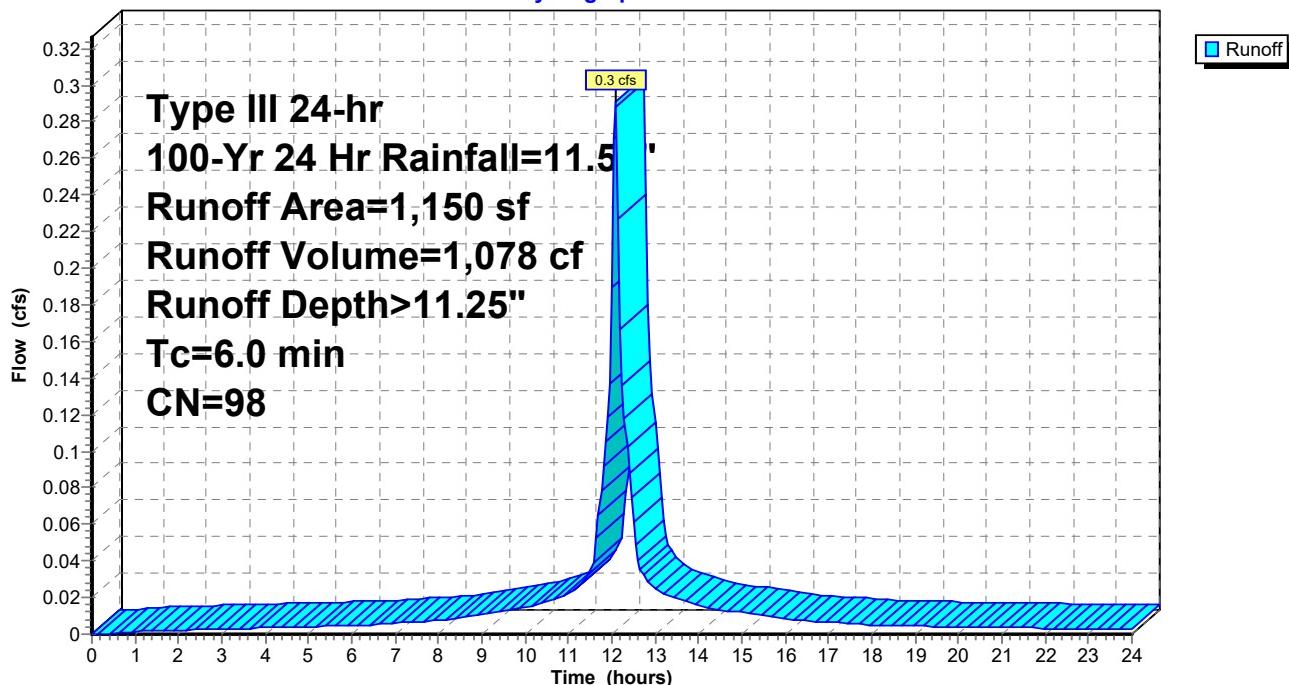
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Yr 24 Hr Rainfall=11.50"

Area (sf)	CN	Description
1,150	98	Roofs, HSG D
1,150		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry,				

Subcatchment PR: ROOF

Hydrograph



Summary for Subcatchment PR-2: ROOF

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,078 cf, Depth>11.25"

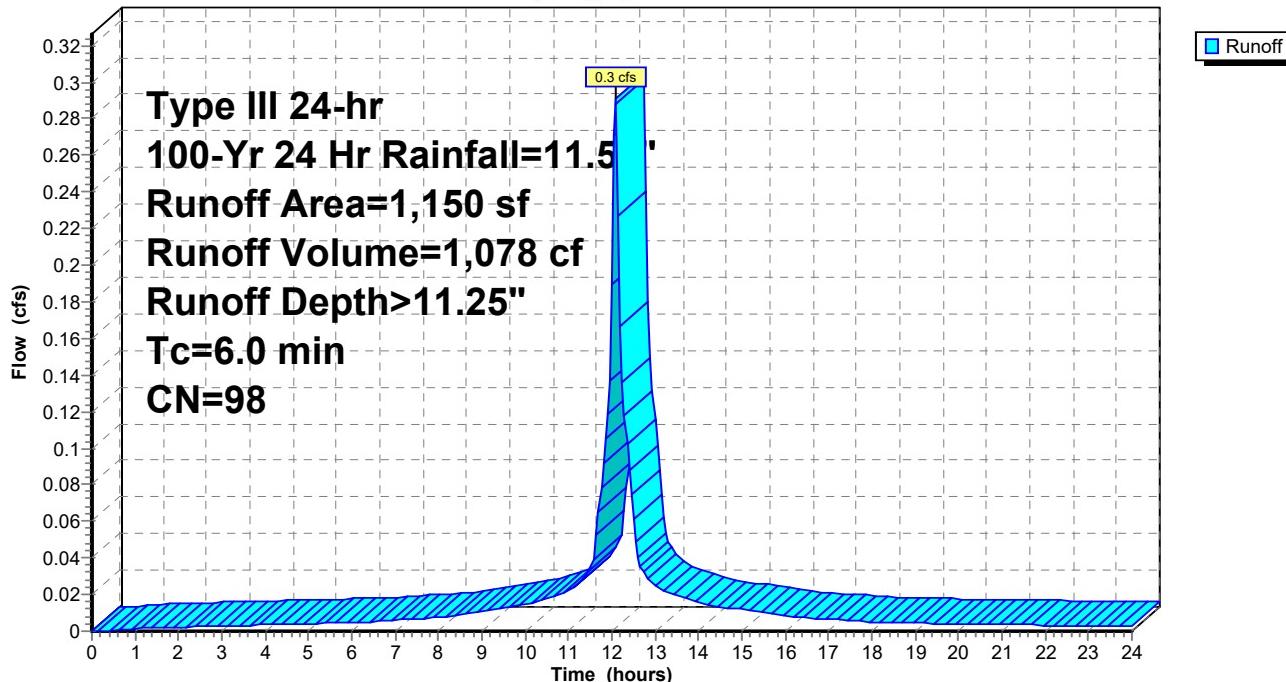
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Yr 24 Hr Rainfall=11.50"

Area (sf)	CN	Description
1,150	98	Roofs, HSG D
1,150		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry,				

Subcatchment PR-2: ROOF

Hydrograph



Summary for Subcatchment SC-100: Subcatchment 100

Runoff = 0.6 cfs @ 12.09 hrs, Volume= 1,959 cf, Depth> 9.62"

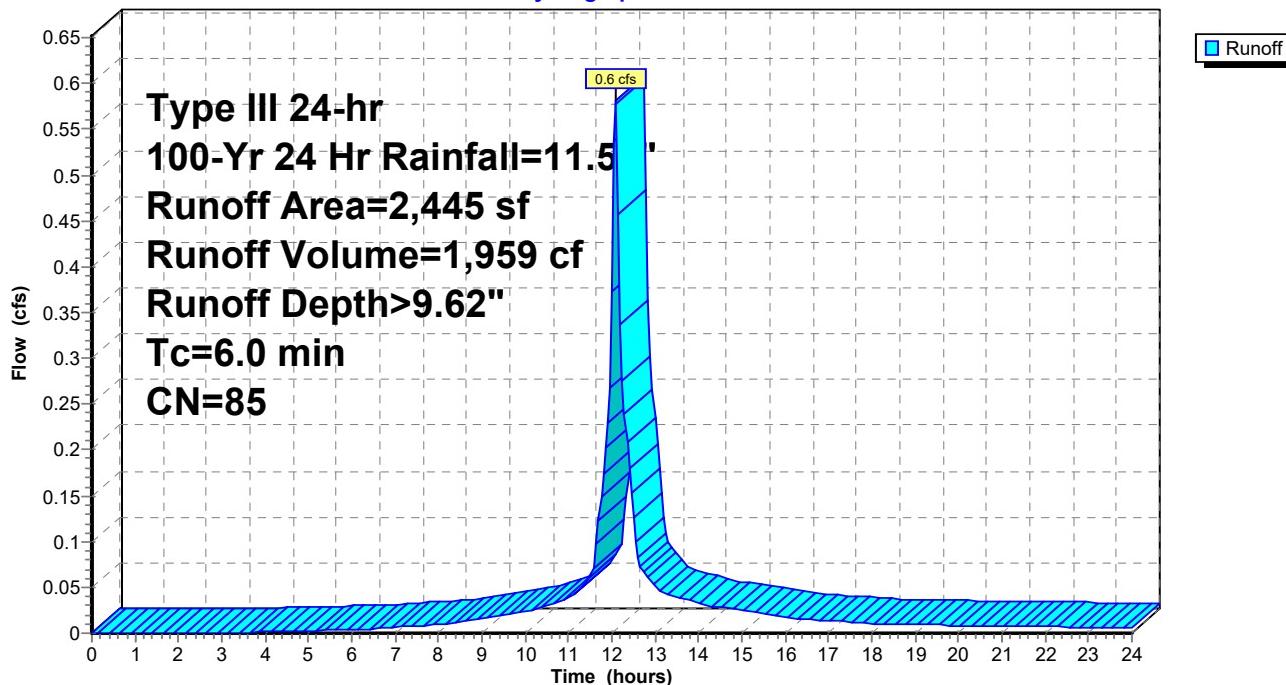
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Yr 24 Hr Rainfall=11.50"

Area (sf)	CN	Description
1,266	80	>75% Grass cover, Good, HSG D
515	80	>75% Grass cover, Good, HSG D
*	664	Pavers, HSG D
2,445	85	Weighted Average
1,781		72.84% Pervious Area
664		27.16% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0	Direct Entry, Min. Engineering Practice				

Subcatchment SC-100: Subcatchment 100

Hydrograph



51 BURCH-POST

Prepared by Patriot Engineering

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Type III 24-hr 100-Yr 24 Hr Rainfall=11.50"

Printed 12/27/2023

Page 41

Summary for Reach DP-1: Design Point 1

Summary for Reach DP-2: Design Point 2

Inflow Area = 6,093 sf, 70.77% Impervious, Inflow Depth > 4.17" for 100-Yr 24 Hr event

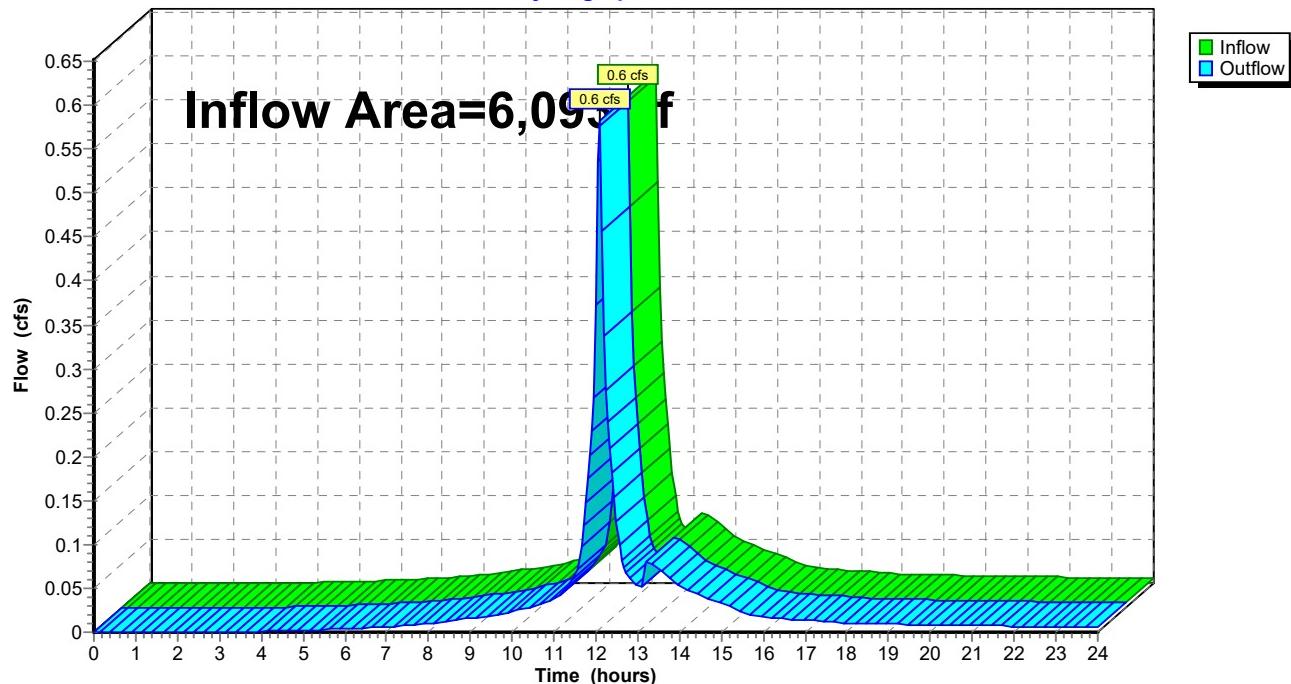
Inflow = 0.6 cfs @ 12.09 hrs, Volume= 2,116 cf

Outflow = 0.6 cfs @ 12.09 hrs, Volume= 2,116 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point 2

Hydrograph



Summary for Pond DS: DRIVE STONE

Inflow Area = 1,824 sf, 100.00% Impervious, Inflow Depth > 11.25" for 100-Yr 24 Hr event
 Inflow = 0.5 cfs @ 12.09 hrs, Volume= 1,710 cf
 Outflow = 0.0 cfs @ 13.27 hrs, Volume= 1,020 cf, Atten= 93%, Lag= 71.1 min
 Discarded = 0.0 cfs @ 13.27 hrs, Volume= 942 cf
 Primary = 0.0 cfs @ 13.27 hrs, Volume= 78 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 1.91' @ 13.27 hrs Surf.Area= 475 sf Storage= 905 cf

Plug-Flow detention time= 246.2 min calculated for 1,018 cf (60% of inflow)
 Center-of-Mass det. time= 131.9 min (868.6 - 736.8)

Volume	Invert	Avail.Storage	Storage Description	
#1	0.00'	950 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
0.00	475	0	0	475
2.00	475	950	950	630

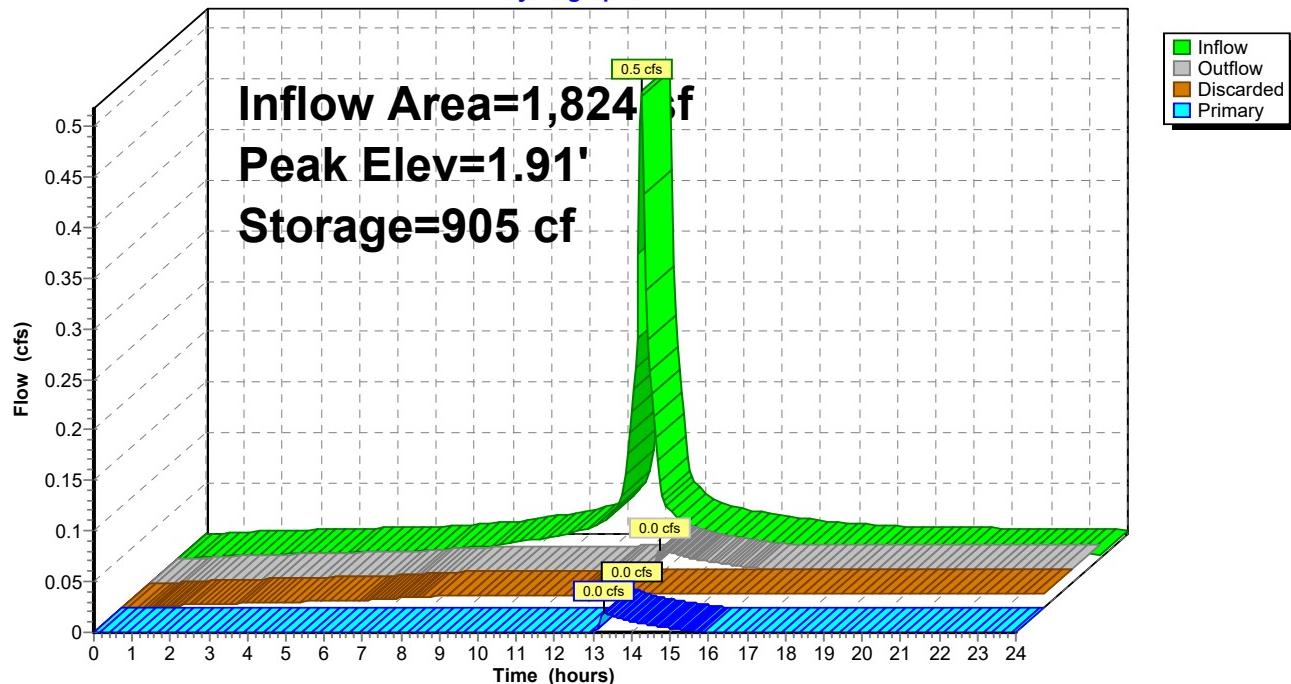
Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	1.90'	8.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.0 cfs @ 13.27 hrs HW=1.91' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 13.27 hrs HW=1.91' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Weir Controls 0.0 cfs @ 0.2 fps)

Pond DS: DRIVE STONE**Hydrograph**

Summary for Pond DS-2: DRIVE STONE

Inflow Area = 1,824 sf, 100.00% Impervious, Inflow Depth > 11.25" for 100-Yr 24 Hr event
 Inflow = 0.5 cfs @ 12.09 hrs, Volume= 1,710 cf
 Outflow = 0.0 cfs @ 13.27 hrs, Volume= 1,020 cf, Atten= 93%, Lag= 71.1 min
 Discarded = 0.0 cfs @ 13.27 hrs, Volume= 942 cf
 Primary = 0.0 cfs @ 13.27 hrs, Volume= 78 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 1.91' @ 13.27 hrs Surf.Area= 475 sf Storage= 905 cf

Plug-Flow detention time= 247.2 min calculated for 1,020 cf (60% of inflow)
 Center-of-Mass det. time= 131.9 min (868.6 - 736.8)

Volume	Invert	Avail.Storage	Storage Description	
#1	0.00'	950 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
0.00	475	0	0	475
2.00	475	950	950	630

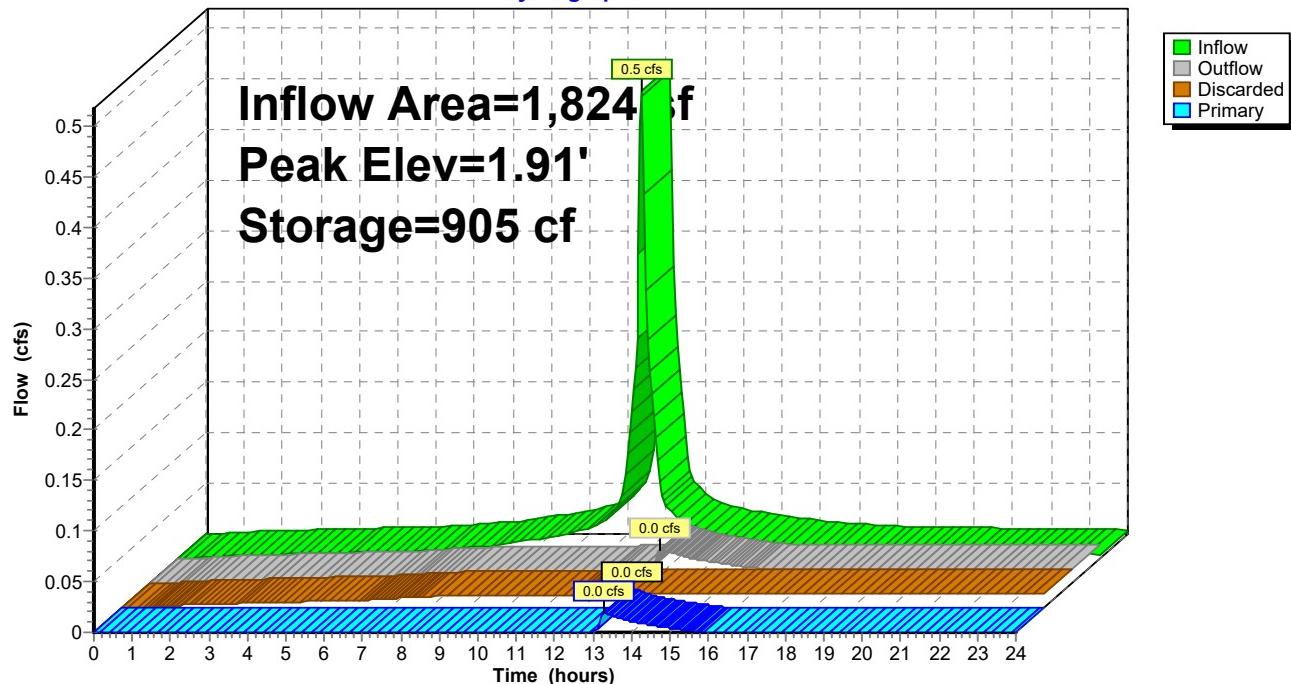
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#1	Discarded	0.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	1.90'	8.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.0 cfs @ 13.27 hrs HW=1.91' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 13.27 hrs HW=1.91' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Weir Controls 0.0 cfs @ 0.2 fps)

Pond DS-2: DRIVE STONE**Hydrograph**

Middlesex County, Massachusetts

655—Udorthents, wet substratum

Map Unit Setting

National map unit symbol: vr1n

Elevation: 0 to 3,000 feet

Mean annual precipitation: 32 to 54 inches

Mean annual air temperature: 43 to 54 degrees F

Frost-free period: 110 to 240 days

Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, wet substratum, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Wet Substratum

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: More than 80 inches

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Minor Components

Urban land

Percent of map unit: 8 percent

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope

Down-slope shape: Linear

Across-slope shape: Linear

Freetown

Percent of map unit: 4 percent

Landform: Depressions, bogs

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Dip

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent

Landform: Depressions, bogs



Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Dip

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts

Survey Area Data: Version 23, Sep 12, 2023



**OPERATION AND MAINTENANCE & EROSION CONTROL
PROGRAM
FOR
51 BURCH STREET ARLINGTON, MASSACHUSETTS**

**PREPARED FOR:
SA DEVELOPMENT
200F Main Street Box 352
Stoneham, MA 02180**

**PREPARED BY:
PATRIOT Engineering, LLC
PO BOX 362
Lexington, Massachusetts 02420
(978)726-2654**

DATE: December 27, 2023



Project Name: 51 Burch Street
Arlington, MA

Applicants: SA Development
200F Main Street Box 352
Stoneham MA 02180

Party Responsible for Maintenance During Construction: Contractor

Party Responsible for Maintenance After Construction: Property Owner

Erosion and Sedimentation Control Measures during Construction Activities

Filtermitt

Filtermitt will be installed along the down gradient limit of work as depicted on the Site Construction Plan. The Filtermitt will be installed prior to the commencement of any work on-site. An additional supply of Filtermitt shall be on-site to replace and/or repair Filtermitt that is disturbed. The lines of Filtermitt shall be inspected and maintained on a weekly basis during construction. No construction activities are to occur beyond the Filtermitt at any time. Sediment shall be removed once the volume reaches ¼ to ½ the height of the Filtermitt.

Surface Stabilization

The surface of all disturbed areas shall be stabilized during and after construction. Disturbed areas remaining idle for more than 14 days shall be stabilized. Temporary measures shall be taken during construction to prevent erosion and siltation. No construction sediment shall be allowed to enter any infiltration system or formal drainage system. All disturbed slopes will be stabilized with a permanent vegetative cover. Some or all of the following measures will be utilized on this project as conditions may warrant.

- a. Temporary Seeding
- b. Temporary Mulching
- c. Permanent Seeding
- d. Placement of Sod
- e. Hydroseeding
- f. Placement of Hay
- g. Placement of Jute Netting Dust shall be controlled at the site.

Tree Protection

Existing trees to be saved shall be protected with orange construction fence (offset from the tree trunk by professional standard based on canopy).

Subsurface Infiltration Facilities

Construction activity above and around the proposed location of the subsurface infiltration facility shall be limited to prevent compaction of the existing soil. Care shall be taken to redirect stormwater runoff from this area to prevent ponding. Installation of this system shall occur under dry weather conditions and system shall be backfilled immediately to prohibit the introduction of fines or other material that would compromise the functionality of this system.

Silt Sacks

Silt Sacks shall be installed within the basins. The performance of the basins shall be checked after every major storm event during construction, in the event of clogging within the Silt Sack, it shall be removed and replaced with a clean Silt Sack. Stormwater quality unit shall be checked bi-weekly.

Removal of Sediment and Erosion Controls

At the completion of construction activities and after receiving approval from the Town of Arlington, all physical sediment and erosion controls shall be removed from the site.

Long-Term Inspection and Maintenance Measures after Construction

Erosion Control

Eroded sediments can adversely affect the performance of the stormwater management system. Eroding or barren areas should be immediately re-vegetated.

Pervious Paver / Infiltration Facility

The infiltration system inspections should include inspections following the first several rainfall events or first few months after construction, after all major storms (3.2" inches of rain over a 24-hour period or greater), and on regular bi-annual scheduled dates, to ascertain whether captured runoff drains within 72 hours following the event. Ponded water above the system after several dry days often indicates that the bottom of the system is clogged. If the water does not drain, then a qualified professional should be retained to determine the cause of apparent infiltration failure and recommend corrective action. Such corrective action should be immediately implemented by the homeowner.

Debris and Litter Removal

Trash may collect in the BMP's, potentially causing clogging of the facilities. All debris and litter shall be removed when necessary, and after each storm event. Sediment and debris collected from vacuuming and/or sweeping should be disposed of at a permitted waste disposal facility. Avoid disposing of this material on site, where it could be washed into the proposed subsurface infiltration systems.

STORMWATER MANAGEMENT
CONSTRUCTION PHASE

INSPECTION SCHEDULE AND EVALUATION CHECKLIST

PROJECT LOCATION: 51 Burch Street

WEATHER: _____

<i>Inspection Date</i>	<i>Inspector</i>	<i>Area Inspected</i>	<i>Required Inspection Frequency if BMP</i>	<i>Comments</i>	<i>Recommendation</i>	<i>Follow-up Inspection Required (yes/no)</i>
		<i>Filtermitt</i>	<i>Weekly and After Major Storm Events</i>			
		<i>Pervious Paver</i>	<i>Weekly and After Major Storm Events</i>			
		<i>Siltsack</i>	<i>Weekly and After Major Storm Events</i>			

-
- (1) Refer to the Massachusetts Stormwater Handbook, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.
 - (2) Inspections to be conducted by a qualified professional such as an environmental scientist or civil engineer.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.

Other notes: (Include deviations from: Con. Comm. Order of Conditions, PB Approval, Construction Sequence and Approved Plan)
Stormwater Control Manager: _____

STORMWATER MANAGEMENT
AFTER CONSTRUCTION

INSPECTION SCHEDULE AND EVALUATION CHECKLIST

PROJECT LOCATION: 51 Burch Street

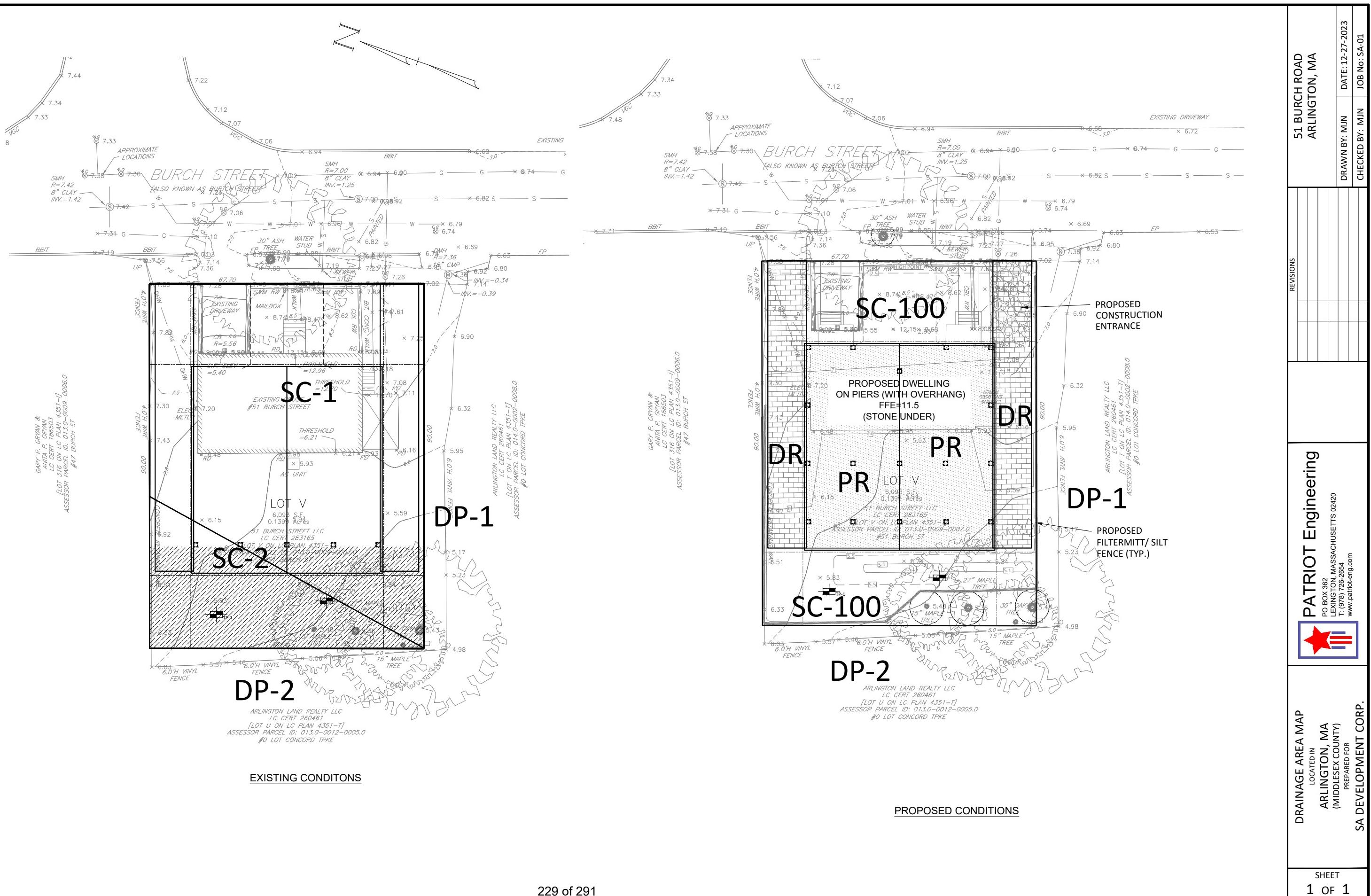
WEATHER: _____

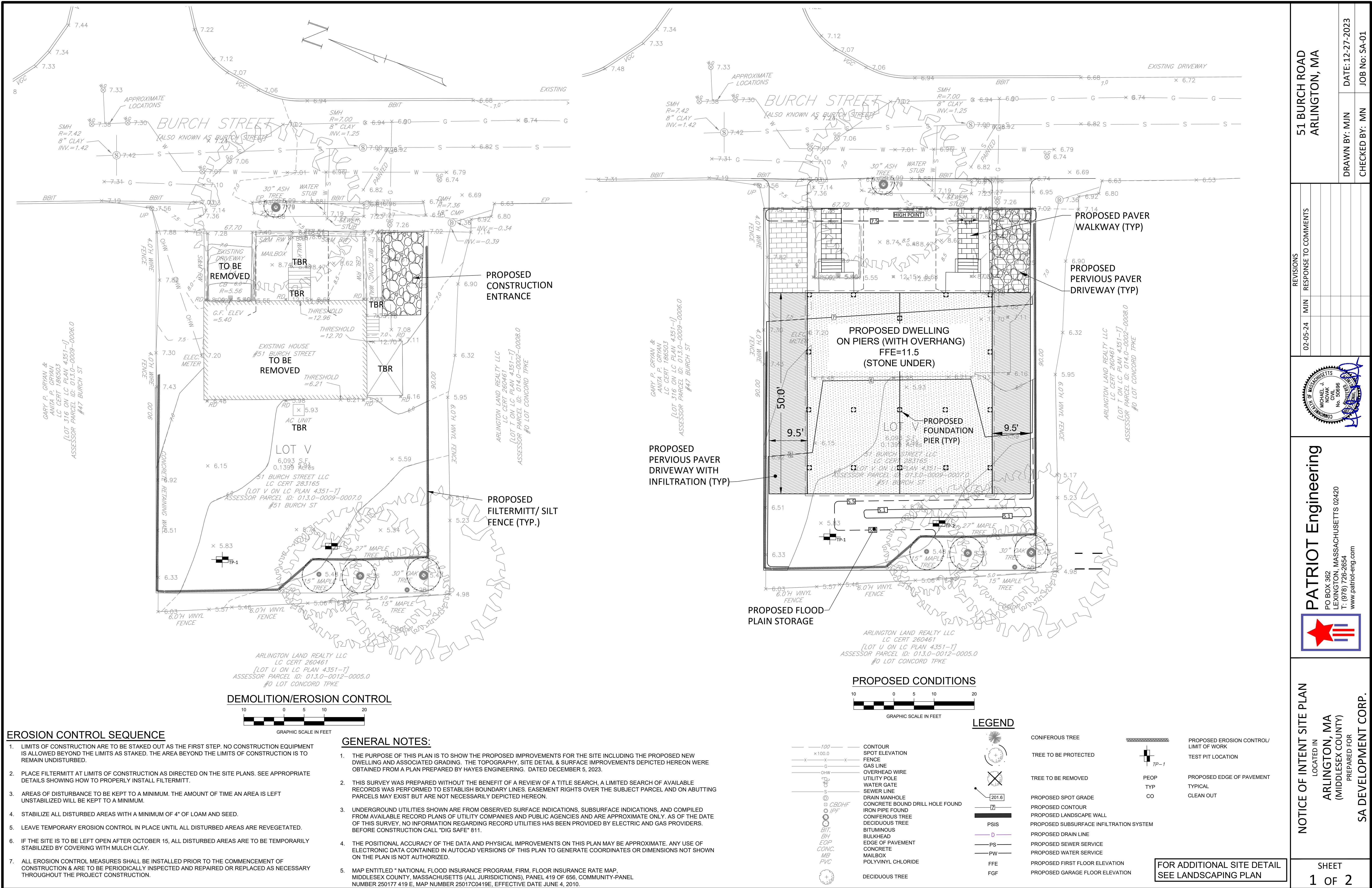
<i>Inspection Date</i>	<i>Inspector</i>	<i>Area Inspected</i>	<i>Required Inspection Frequency if BMP</i>	<i>Comments</i>	<i>Recommendation</i>	<i>Follow-up Inspection Required (yes/no)</i>
		Pervious Paver	<i>Bi-annually and After Major Storm Events</i>			

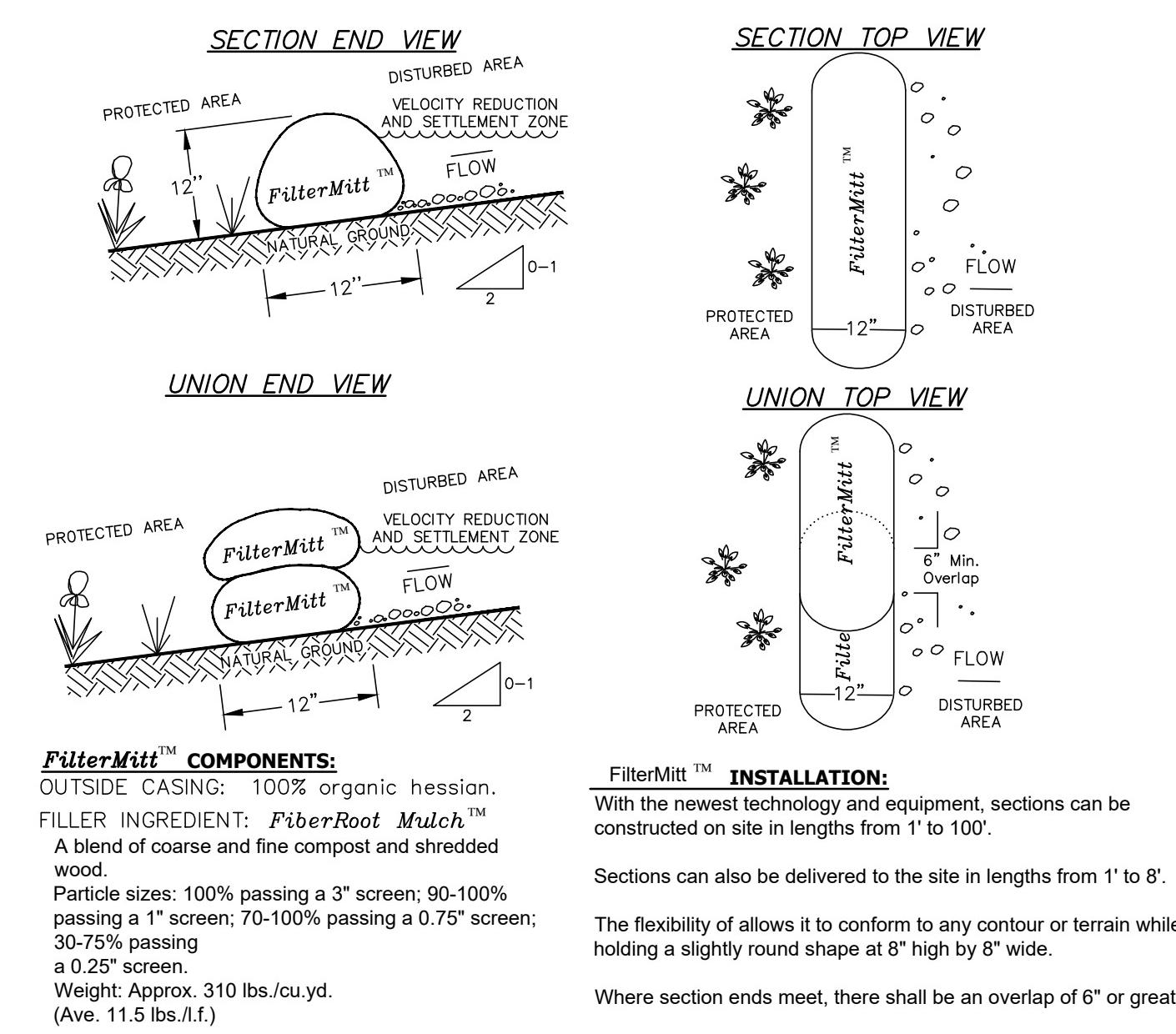
-
- (3) Refer to the Massachusetts Stormwater Handbook, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.
(4) Inspections to be conducted by a qualified professional such as an environmental scientist or civil engineer.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.

Other notes: (Include deviations from: Con. Comm. Order of Conditions, PB Approval, Construction Sequence and Approved Plan)
Stormwater Control Manager: _____





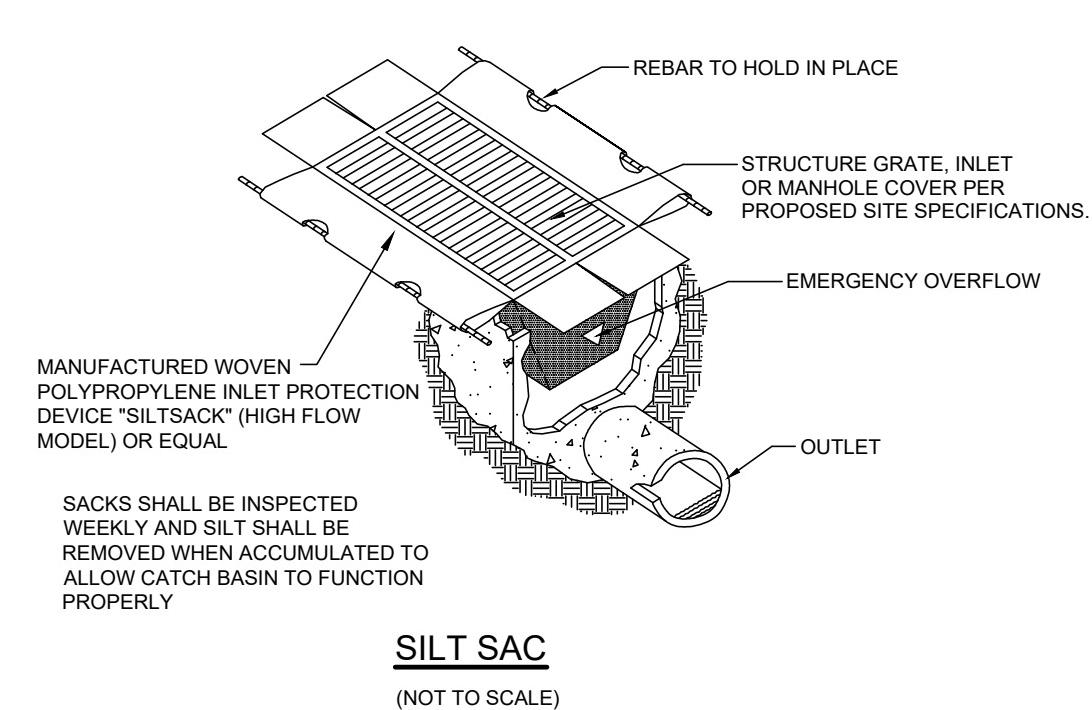


FilterMitt™ COMPONENTS:
OUTSIDE CASING: 100% organic hessian.
FILLER INGREDIENT: *FiberRoot Mulch™*
A blend of coarse and fine compost and shredded wood.
Particle sizes: 100% passing a 3" screen; 90-100% passing a 1" screen; 70-100% passing a 0.75" screen; 30-75% passing a 0.25" screen.
Weight: Approx. 310 lbs./cu.yd.
(Ave. 11.5 lbs./l.f.)

FILTERMITT 2:1 SLOPES OR LESS

(NOT TO SCALE)

FilterMitt™ INSTALLATION:
With the newest technology and equipment, sections can be constructed on site in lengths from 1' to 100'.
Sections can also be delivered to the site in lengths from 1' to 8'.
The flexibility allows it to conform to any contour or terrain while holding a slightly round shape at 8" high by 8" wide.
Where section ends meet, there shall be an overlap of 6" or greater.



SILT SAC

(NOT TO SCALE)

TEST PIT DATA

SOIL TEST PERFORMED BY
MICHAEL NOVAK PE (PE#50696)
DATED NOVEMBER 8, 2023

TEST PIT TP-1

ELEVATION = 5.8

0"-9"	A	LOAM
9"-34"	B	SILT LOAM
34"-95"	C	SILT LOAM

ESHGW OBSERVED AT 64" EL=0.46 (WEEPING)
NO MOTTLES OBSERVED ABOVE ELEV. 0.46

TEST PIT TP-2

ELEVATION = 5.5

0"-10"	A	LOAM
10"-30"	B	SILT LOAM
30"-84"	C	SILT LOAM

ESHGW OBSERVED AT 64" EL=0.16 (WEEPING)
NO MOTTLES OBSERVED ABOVE ELEV. 0.16

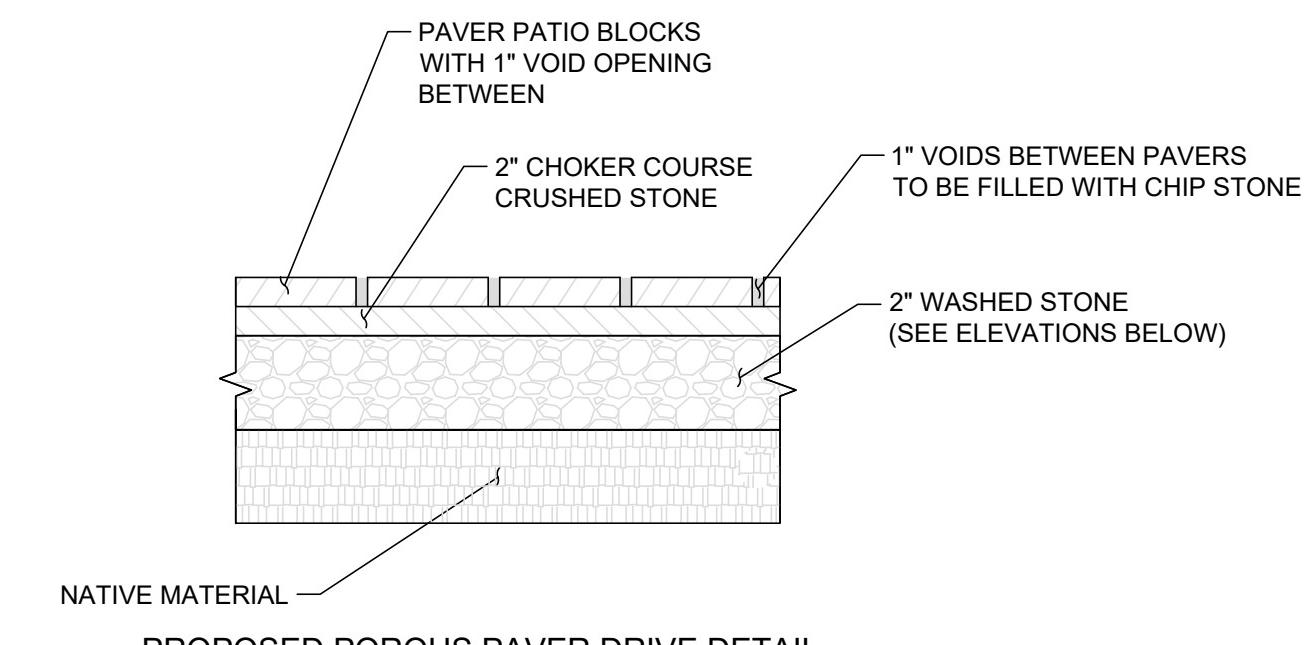
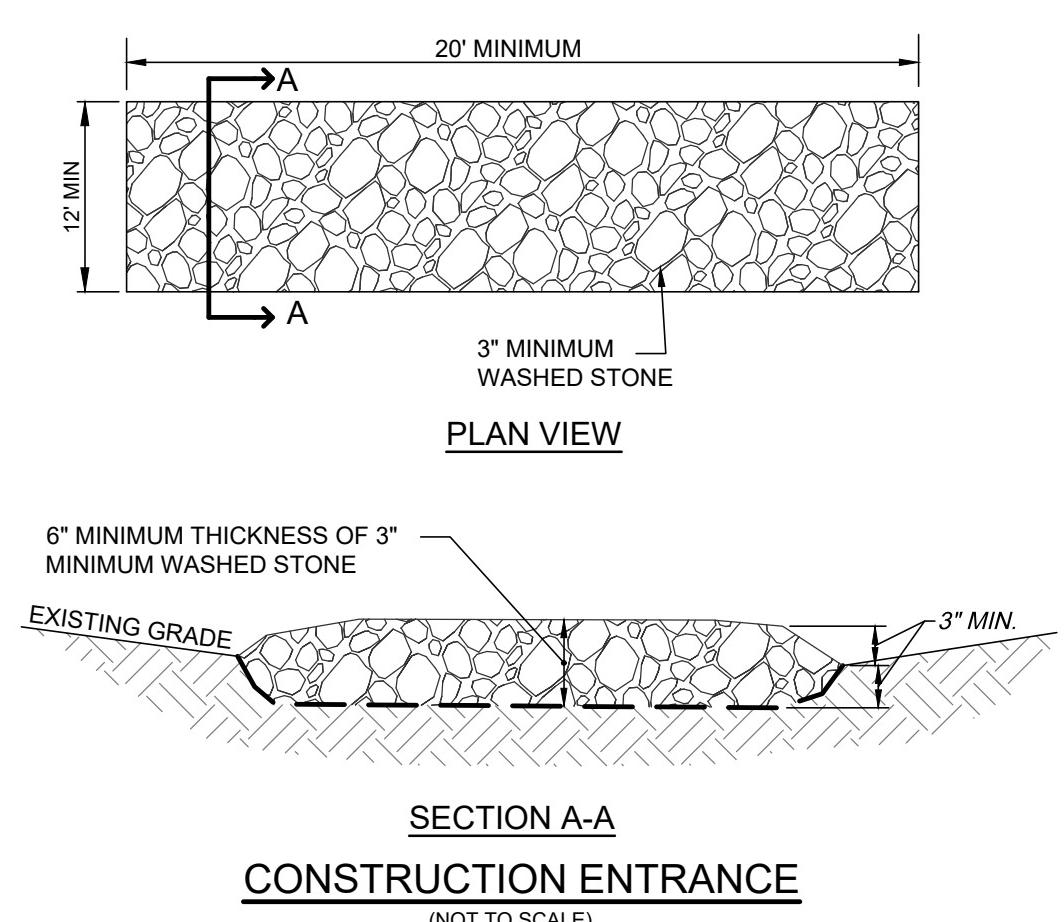
FLOOD STORAGE CHART

FLOOD PLAIN SUMMARY

FLOOD ELEV	PROPOSED FILL		PROPOSED STORAGE		RATIO
	AREA OF FILL	VOLUME(cf)	AREA	VOLUME(cf)	
5.3-5.5	168	33.6	302	91	2.7
5.5-6.0	187	93.5	597	299	3.2
6.0-7.0	7	7	955	955	136.4

GENERAL NATIVE LANDSCAPE NOTES

1. NO LANDSCAPE CULTIVARS OR VARIETIES OF THESE NATIVE PLANTS ARE ALLOWED. WITHOUT PRIOR APPROVAL FROM THE CONSERVATION COMMISSION.
2. ALL SAPLING TREES SHALL MEASURE 4-6 FEET HIGH WITH 1-1.5" CALIPERS.
3. ALL SHRUBS SHALL MEASURE 2-3 FEET HIGH. SAPLING TREES WILL BE SPACED 10-15+ FEET APART (ON CENTER), WHILE SHRUBS WILL BE PLANTED IN CLUSTERS WITH INDIVIDUALS SPACED 5'- FEET APART (ON CENTER).
4. THE APPLICANT SHALL SUBMIT RECEIPT(S) FOR NATIVE PLANTINGS TO THE ARLINGTON CONSERVATION COMMISSION, AND THE NATIVE PLANTINGS WILL BE MONITORED FOR TWO (2) GROWING SEASONS FOLLOWING PLANTING TO DOCUMENT SURVIVAL.
5. ANNUAL MONITORING REPORTS SHALL BE SUBMITTED TO THE ARLINGTON CONSERVATION COMMISSION DOCUMENTING THE HEALTH OF THE PLANTS, INCLUDE REPRESENTATIVE PHOTOGRAPHS, AND DOCUMENT ANY REPLACEMENT PLANTS AND/OR MANAGEMENT EFFORTS NEEDED TO ENSURE SUCCESS.
6. A PLANTING PLAN DEPICTING THE LOCATION OF THE INSTALLED PLANTS SHALL BE PROVIDED TO THE CONSERVATION COMMISSION WITHIN 30 DAYS OF PLANTING.



PROPOSED POROUS PAVER DRIVE DETAIL

PROPOSED ELEVATIONS

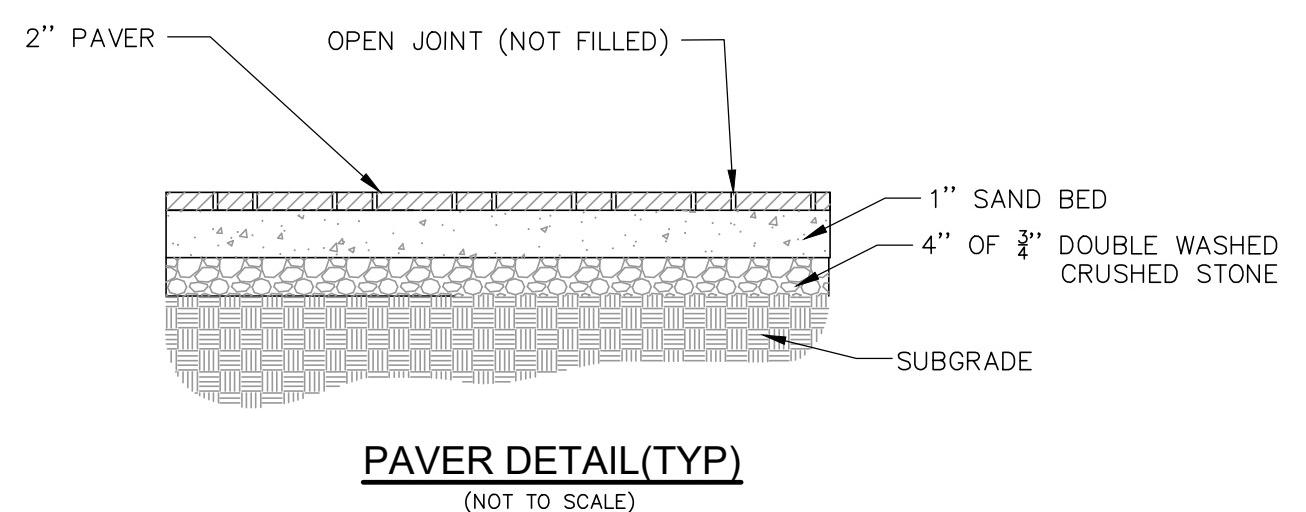
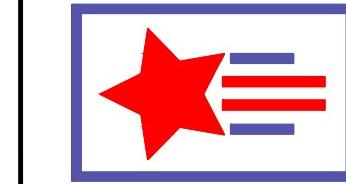
TOP OF STONE: 6.0
BOTTOM OF STONE: 4.0
MIN 2.0' DEPTH OF STONE IN ALL PLACES

PROPOSED STORAGE

TOP OF STONE: 6.0
BOTTOM OF STONE: 4.0
MIN 2.0' DEPTH OF STONE IN ALL PLACES

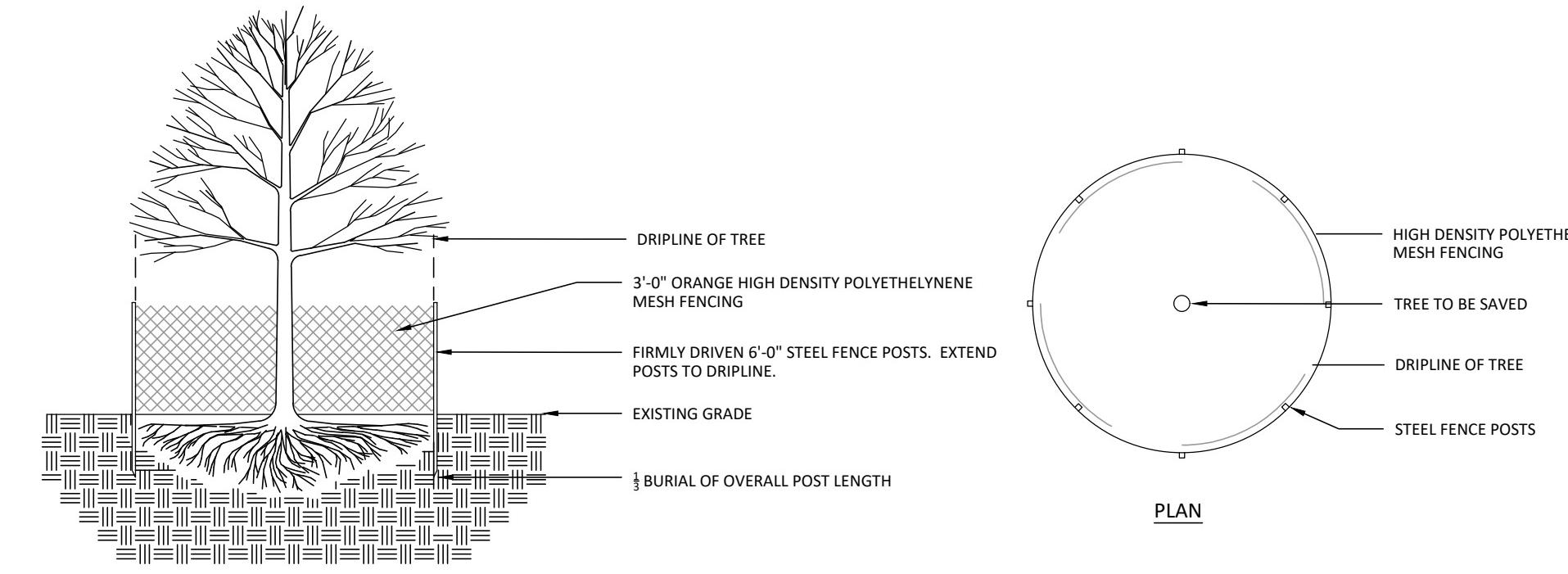
TOTAL AREA PROVIDED ON EACH DRIVE = 9.5X50' = 475 SF
TOTAL STORAGE PROVIDED = 475*2=950 CF

PATRIOT Engineering
PO BOX 382
LEXINGTON, MASSACHUSETTS 02420
T: (978) 26-2654
www.patriot-eng.com



PAVER DETAIL(TYP)

(NOT TO SCALE)



TREE PROTECTION

(NOT TO SCALE)

NOTICE OF INTENT SITE PLAN
LOCATED IN
ARLINGTON, MA
(MIDDLESEX COUNTY)
PREPARED FOR
SA DEVELOPMENT CORP.

SHEET
2 OF 2

51 BURCH ROAD ARLINGTON, MA	DRAWN BY: MJN	DATE: 12-27-2023
CHECKED BY: MJN	JOB No: SA-01	



Town of Arlington, Massachusetts

DEP #091-0356: Notice of Intent: Thorndike Place (continued from 2/1/2024)

Summary:

The Conservation Commission will hold a public hearing under the Wetlands Protection Act to consider a Notice of Intent for the construction of Thorndike Place, a multifamily development on Dorothy Road in Arlington. This hearing will be limited to discussion regarding the third party stormwater peer review.

ATTACHMENTS:

Type	File Name	Description
□ Reference Material	2024-02-14_Revised_Thorndike_Place_Stormwater_Review.pdf	2024-02-14 Revised Thorndike Place Stormwater Review
□ Reference Material	2024-02-13_Response_to_Stormwater_Peer_Review_Comments.pdf	2024-02-13 Response to Stormwater Peer Review Comments
□ Reference Material	Horsley_supplemental_letter_020924.pdf	2024-02-09 Horsley supplemental letter
□ Reference Material	2023-02-07-Thorndike_Stormwater_Review.pdf	2024-02-07 Thorndike Stormwater Review
□ Reference Material	2024-01-07_Response_to_Landscape_Restoration_Peer_Review.pdf	2024-01-07 Response to Landscape Restoration Peer Review

Project Memo

H373095

2024-02-14

To: Mr. Ryan Clapp and Mr. David Morgan,
Environmental Planner + Conservation
Agent

From: Ross Mullen

cc: Duke Bitsko, Rob Kenneally, and Chris
Ghormley

**Town of Arlington
Thorndike Place Stormwater Review****Thorndike Place Stormwater Review****Executive Summary to the Conservation Commission**

After review of the proposed Thorndike Place stormwater site design relative to the Massachusetts Stormwater Handbook, Hatch has determined the project is in compliance with the following conditions:

1. Permanent establishment of vegetation on the south side of the senior living complex prior to runoff from the roof discharging to the wetland and verification of non-erosive velocities of this discharge.
2. Applicant verifies that at least ten feet of separation is provided between the R-Tank^{XD} features and the townhome basement foundations.
3. Review and, if necessary, resubmission of groundwater mounding analysis of the Stormtrap ST1 infiltration feature to demonstrate compliance. Provide a defensible basis for the selected horizontal hydraulic conductivity and duration of infiltration period. Verify adequate separation is provided between the senior living complex and the mounded groundwater table.
4. If the applicant uses asphalt shingles on the townhomes, to manage the loose grit from the shingles:
 - a. The roof drains shall remain disconnected from the Stormtrap ST1 infiltration system until after construction is substantially complete and connected prior to occupancy or
 - b. The R-Tank^{XD} systems shall be inspected, and loose grit removed prior to occupancy.

Separately from the Massachusetts Stormwater Handbook, our peer review also included review of the project with respect to the floodplain rules within the Code of Federal Regulations (CFR) and stormwater engineering best practices. These comments are

If you disagree with any information contained herein, please advise immediately.

H373095-0000-222-030-0001, Rev. A

Page 1
233 of 291

provided to inform the Conservation Commission of the concerns Hatch has with respect to the CFR and stormwater engineering best practices:

- The window of uncertainty based on the determined groundwater elevations is only 0.02-feet for the proposed design to meet Massachusetts Stormwater Handbook Standards 3 and 4. Infiltration within fill soils and proximal to a wetland is atypical for stormwater site design because these soils are typically saturated and not conducive to infiltration.
- The project should be sequenced so as to comply with the Code of Federal Regulations §60.3 and applicable FEMA floodplain regulations, including, if necessary, completion of a LOMR-F and/or seepage analysis to determine the structure is reasonable safe from flooding. As a member community of the National Flood Insurance Program (NFIP), the Town of Arlington is required to follow the regulatory standards of the NFIP.
- As an industry best practice, dry and/or wet flood proofing of the townhome basements should be secondary to good stormwater and drainage design that limits opportunities for surface and groundwater intrusion into structures. Hatch remains very concerned about both the lateral proximity and vertical offset of the infiltration basins to the townhomes and potential for groundwater intrusion into these structures from both the Stormtrap ST1 and R-Tank^{XD} features. The Town of Arlington's Zoning Bylaws§ 5.8.6.A (2), which were subject to comment during the Comprehensive Permit, are based on similar flood prevention principles and require four feet of separation between the seasonal high groundwater elevation and the low floor.

1. Project Overview

The Town of Arlington contracted with Hatch Associates Consultants, Inc. (Hatch) to complete a third-party stormwater review of the proposed Thorndike Place development on December 19, 2023.

1.1 General Information

Project Location: Dorothy Road between Route 2/Concord Turnpike on the south, existing residential neighborhoods to the north and west, and Thorndike Park to the east within the Town of Arlington, Massachusetts.

Project Purpose: Construct a rental and ownership community of 12-multifamily homes within six duplex buildings and a 124-unit senior-living residential apartment building complex. The construction is proposed on a 17.7-acre parcel with 12-acres proposed to be preserved as open space under a Conservation Restriction.

Impaired Waterbodies within 1 Mile of Proposed Project:

- Little River (MA71-21) for Debris, Water Chestnut, Chloride, Copper in Sediment, Dissolved Oxygen, Enterococcus, E. Coli, Flocculant Masses, Lead in Sediment, Odor, Oil and Grease, PCBs in Fish Tissue, Total Phosphorus, Scum/Foam, Transparency/Clarity, and Trash.
- Clay Pit Pond (MA71011): Chlordane in Fish Tissue.
- Black's Nook (MA71005): Water Chestnut, Nutrient/Eutrophication Biological Indicators, and Transparency/Clarity.
- Alewife Brook (MA71-20) for Debris, Water Chestnut, Chloride, Copper in Sediment, Dissolved Oxygen, Enterococcus, E. Coli, Flocculant Masses, Lead in Sediment, Odor, Oil and Grease, PCBs in Fish Tissue, Total Phosphorus, Scum/Foam, Sediment Bioassay, Transparency/Clarity, and Trash.
- Little Pond (MA71024) for Water Chestnut and Harmful Algal Blooms.
- Spy Pond (MA71040) for Curly-leaf pondweed, Eurasian Water Milfoil, Myriophyllum Spicatum, Water Chestnut, Chlordane in Fish Tissue, DDT in Fish tissue, Dissolved Oxygen, Harmful Algal Blooms, and Total Phosphorus.

TMDLs: None (other reaches of Alewife Brook have been included in TMDL studies).

Contact Information:

Contact Information	Applicant	Applicant's Agent
Company Name	Arlington Land Realty, LLC	BSC Group, Inc.
Attention	Peter Mugar	Dominic Rinaldi, PE
Address	116 Huntington Avenue	803 Summer Street

	Boston, MA 02116	Boston, MA 02127
Phone	617-459-9587	617-896-4386
Email	psmugar@gmail.com	drinaldi@bscgroup.com

Reviewed Submittals:

1. *Thorndike Place Residential Community Notice of Intent Cover Letter*; prepared by Dominic Rinaldi of the BSC Group, Inc. on behalf of Arlington Land Realty, LLC; dated September 6, 2023.
2. *Thorndike Place Residential Community Notice of Intent*; prepared for Arlington Land Realty LLC by BSC Group; submitted to the Town of Arlington Conservation Commission; dated September 2023.
3. *Stormwater Report Thorndike Place Dorothy Road Arlington, MA*; prepared by BSC Group for Arlington Land Realty, LCC November 2020, revised August 2021, revised September 2023; dated September 5, 2023.
4. *Thorndike Place Notice of Intent* drawing package; prepared for Arlington Land Realty, LLC by BSC Group, dated September 6, 2023.

2. Findings

The following are Hatch's findings on the Thorndike Place stormwater site design based on our professional judgement and in accordance with the Massachusetts Stormwater Handbook and Stormwater Standards (2008).

2.1 General Findings

The following are a list of general findings and observations:

- The applicant proposes to develop a 17.7-acre parcel, disturbing 4.02 acres and create 1.81-acres of impervious surfacing, leaving the remainder of the parcel under a Conservation Restriction (approximately 12 acres).
No response required.
- 5 infiltration systems, one infiltration chamber, and one bioretention basin/rainwater garden are proposed to provide stormwater treatment/management.
No response required.
- Alewife Brook runs through the southeast corner of this property. The Alewife Brook corridor includes wetlands, Bordering Lands Subject to Flood, Buffer Zone to Bordering Vegetated Wetlands, and FEMA floodplain/floodway.

[BSC Group Response; January 24, 2024] Alewife Brook is not located on the property, but rather approximately 800-feet southeast of the property. The wetlands

at the southeast corner of the property are hydraulically connected to the Little River/Alewife Brook via three culverts that run underneath Route 2.

[Hatch response; February 7, 2024] Noted, no additional action required.

2.2 Standard 1: Untreated Discharges

No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

Hatch completed a review of the design relative to Standard 1; the following is a list of our findings:

- Stormwater runoff from the eastern portion of the senior living building (approximately 14,800 square-feet) is directed to a rip-rap apron that drains to a nearby wetland. The applicant should verify discharge from this roof, during extreme events, will not cause erosion and sedimentation into the wetland.

[BSC Group Response; January 24, 2024] This rip-rap apron has been sized to accommodate the peak flow associated with the 100-year storm from the outlet pipe for this portion of the roof runoff, such that there will be no erosion or scour. Please see Section 6.04 of the Stormwater Report for the rip-rap apron sizing calculations and Sheet C-202 for the detail of Flared End Section w/Stone Protection (Dissipation Bowl). For reference, the roof drain in question utilized flared end FES2.

[Hatch response; February 7, 2024] Based on conversation on February 6, 2024 facilitated by Chuck Tirone between the BSC Group and Hatch, the BSC group will verify that there is not erosion caused by runoff after it has discharged from the riprap apron.

2.3 Standard 2: Peak Rate Control and Flood Prevention

Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for land subject to coastal storm flowage.

Hatch completed a review of the design relative to Standard 2; the following is a list of our findings and recommendations:

- Surficial fill soils were designated as a Hydrologic Soil Group C, and infiltration rates (0.52-inches/hour) were selected to be on the edge of published values for HSG C those soils, based varying composition of sandy loam, fine sandy loam and gravelly sandy loam.

[BSC Group Response; January 24, 2024] No response required.

- FEMA Technical Bulletin 6-93, Below-Grade Parking Requirements for Buildings Located in Special Flood Hazard Areas, clarified FEMA's policy that below grade parking is consistent with their definition of a basement, and that construction of the lowest floor (including basements) below the base flood elevation is prohibited for residential buildings. The FEMA base flood elevation "100-year" is 6.8-feet. As the building is proposed to be used for senior living residences and the proposed floodplain is adjacent to the structure, the proposed underground garage with elevation of 6.0-feet is below the

base flood elevation (plus applicable freeboard and floodway surcharge requirements). Therefore, the proposed garage has a significant flood risk, as identified by FEMA.

[BSC Group Response; January 24, 2024] While the FEMA Technical Bulletin is not specifically applicable to a review under the Wetlands Protection Act and MassDEP's Stormwater Standards, it prohibits "the construction of below-grade parking garages...beneath residential buildings in Zones A1-A30, AE, and AH." Construction of the senior living building includes filling in the portions of the flood plain and, ultimately, altering its limits. The building will be constructed such that it is entirely outside the limits of the 6.8-foot base flood elevation (BFE). Therefore, construction of a garage beneath this building is allowed. A FEMA Elevation Certificate will be prepared for all buildings at the conclusion of construction demonstrating that all buildings are located above BFE. In addition, all below-grade areas in all buildings will be appropriately waterproofed to prevent groundwater intrusion.

[Hatch response; February 7, 2024] The scope of this review was for all facets of stormwater management. Our accepted proposal states that we will review the project based on industry best practices, Wetland Protection Act, and the Massachusetts Stormwater Handbook. Specifically, our accepted proposal also states that we will complete a review as to the Code of Federal Regulations in regards to the floodplain and that will review the FEMA Floodplain/floodway encroachments as well as CLOMR/LOMR/no-rise documents. Further, the Mass.gov webpage lists the Massachusetts Wetland Protection Act as one regulation and practice that is part of floodplain management. As the Town of Arlington participates in the National Flood Insurance Program, it therefore must abide by the applicable rules and regulations stemming from CFR 60.3.

Based on conversation on February 6, 2024 facilitated by Chuck Tirone between the BSC Group and Hatch, fill is being used to raise the existing structure and separate it from the FEMA floodplain .FEMA NFIP Technical Bulletin 10, published in March 2023, "Reasonably Safe from Flooding Requirement for Building on Filled Land" provides guidance on this topic. Our understanding is that the use of any type of fill to remove a building from the Special Flood Hazard Area (SFHA) requires the LOMR-F, instead of a FEMA Elevation Certificate. Further, our understanding is that FEMAs requires the removal of the land from the SFHA before a basement, excavated into fill, is built below the base flood elevation using a LOMR-F process. It is our understanding that the FEMA then also requires a technical analysis showing the basement (garage) is reasonably safe from flooding and the Town of Arlington's designated local floodplain administrator to sign FEMA's Community Acknowledgement Form. The Town of Arlington's continued participation in the National Flood Insurance Program, with the significant benefit of subsidized flood insurance to its residents, requires it to comply with federal standards.

- The proposed basement elevations of the townhomes (elevation 3.0-feet) are 3.8-feet below the FEMA 100-year flood elevation of 6.8-feet. The proposed separation between these structures appears to be as little as 115-feet. A groundwater mounding analysis of the regional flood along Alewife Brook should be assessed to verify that groundwater intrusion from flooding along the watercourse does not impact the basements of the

townhome structures. Note this is distinct from the completed groundwater mounding analysis of the infiltration basins.

[BSC Group Response; January 24, 2024] A mounding analysis of the regional flood along Alewife Brook is not a requirement under the Wetlands Protection Act and potential basement groundwater intrusion does not fall under the WPA jurisdiction. Additionally, as referenced in our response above, the proposed site work will result in all buildings being located outside the FEMA 100-year BFE and below-grade areas in all buildings will be appropriately waterproofed to prevent groundwater intrusion.

[Hatch response; February 7, 2024] This is a preference comment and can be considered closed.

- Proposed ACF R-Tank^{XD}s between the townhome units are nearly adjacent to the foundations of these structures with basements. The bottom of the chambers of these units are proposed to be at 6.0-feet (with bottom of stone at 5.67-feet), with the basement elevation of the adjacent townhomes at 3.0-feet. When these basins are filled with stormwater runoff, seepage will likely occur adjacent to the basement foundation wall, which will act as a preferential flow path (planar surface) with least resistance downward. Groundwater intrusion flood risk and seepage from these infiltration systems represents a concerning flood risk.

[BSC Group Response; January 24, 2024] See previous response to comments regarding waterproofing of buildings.

[Hatch response; February 7, 2024] No further action, the comment may be considered closed. Additional discussion on separation between groundwater elevation and basements is included in the subsequent bullet.

- Test Pit #1 (2023), located at the proposed ACF R-Tank^{XD} between the westernmost two townhome units, measured a point-in-time groundwater elevation of 1.5-feet, while the proposed basement elevations are at 3.0-feet. The Town of Arlington Zoning bylaws Section 5.8.6.A (2) state that for sites within an Inland Wetland District, at least 4.0-feet of separation should be provided between the floor of occupied levels and the seasonal high-water table.

[BSC Group Response; January 24, 2024] As mentioned in previous comments, the basements of the buildings will be waterproofed to prevent intrusion of groundwater. We also note that project was reviewed and permitted as to local regulations in effect at the date of submittal of the Comprehensive Permit application. This comment references a more recent version of the Zoning Bylaws, and further is not relevant to the stormwater review under the Wetlands Protection Act.

[Hatch response; February 7, 2024] Based on conversation on February 6, 2024 facilitated by Chuck Tirone between the BSC Group and Hatch, we understand that the Comprehensive Permit application was completed and the basement elevations approved prior to this stormwater peer review. The comment may be considered closed.

As a best practice, FEMA advises against construction of basements below the FEMA flood elevation (see Technical Bulletin #10 above) and established groundwater tables as these structures may be prone to damage by hydrostatic pressures and/or groundwater seepage. and note that construction.

A point of clarification, during the site visit, Hatch staff were informed that groundwater elevations were based on readings from “monitoring locations”. We now understand that the groundwater elevations are based on redox methods. As the margin for error is so close between the groundwater elevations and 1. The basement elevations and the seasonal high groundwater table and 2. The required separation between the infiltration feature bottoms and the seasonal high groundwater table, it is incumbent on the Hatch team to thoroughly review the established groundwater elevations as well as any discrepancies.

- Test Pits #2 and #4 pose similar challenges between the proposed basement elevation (3.0-feet) and insufficient separation to the groundwater table, located at 0.8 and 1.5-feet, respectively.

[BSC Group Response; January 24, 2024] See response to above comments.

[Hatch response; February 7, 2024] No further action, the comment may be considered closed. Additional discussion on separation between groundwater elevation and basements is included in the previous bullet.

- Test Pits #3 and #5 (2023) measured a point-in-time groundwater elevations (3.5 and 4.0-feet, respectively) above the proposed basement elevations of adjacent townhomes (3.0-feet).

[BSC Group Response; January 24, 2024] See response to above comments.

[Hatch response; February 7, 2024] No further action, the comment may be considered closed. Additional discussion on separation between groundwater elevation and basements is included in the bullet two above.

- Note that the seasonal high groundwater table may be higher than the 2023 point-in-time measurements and increase flood risk. Additionally, construction of a sump pump system, to mitigate flooding/groundwater intrusion, at any of these residences could lower the regional groundwater table.

[BSC Group Response; January 24, 2024] See response to above comments regarding waterproofing of basement areas. Use of or need for sump pumps has not yet been determined. Should sump pumps be proposed, they will be included in final plans and building permit plans submitted in accordance with the Comprehensive Permit for the Project.

[Hatch response; February 7, 2024] No further action. Comment may be considered closed.

2.4 Standard 3: Recharge to Ground Water

Loss of annual recharge to ground water shall be eliminated or minimized through the use of infiltration measures, including environmentally sensitive site design, low impact development

techniques, best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Hatch reviewed the proposed infiltration systems for Standard 3: Recharge to Ground Water, below are our findings and recommendations:

- Test Pits #7 and #8 (2023) measured point-in-time groundwater elevations of 0.5 and 2.2, respectively. These test pits lie beneath the proposed Stormtrap infiltration system with a proposed bottom elevation of 6.0-feet. Massachusetts Stormwater guidelines state that at least two feet of separation shall be provided between the *seasonal high groundwater elevation* and the bottom of an infiltration structure. Based on our understanding from the site visit, the 2023 groundwater elevations were collected in May. We recommend collection of additional groundwater information, especially during the spring, to verify this standard is met.

[BSC Group Response; January 24, 2024] The highest estimated groundwater elevation on site was found to be 3.98 and was based on the highest observed redoxomorphic features in the soil, which were found in Test Pit #5. All infiltration systems on site were designed with a bottom elevation of 6.0 to provide a minimum of 2-feet of separation to this estimated seasonal high groundwater elevation (ESHGW). The test pits were conducted in Spring (May) of 2023 in coordination with the Town of Arlington Engineering and Conservation Departments and accepted practice under the Wetlands Protection Act, and consistent with the groundwater testing window set out within the Comprehensive Permit. It has been confirmed from USGS that streamflow conditions were within the normal range and that there were not drought conditions in this area at that time. Test pit logs and groundwater elevations can be found in the Stormwater Report. Locations of test pits are shown on the Site Grading and Drainage Plan.

[Hatch response; February 7, 2024] The groundwater of the Stormtrap ST1 infiltration device should be reviewed. Based on simplified methods, Hatch expects approximately 2-3 feet of groundwater mounding beneath this basin for the design storms.

- Additional comments regarding groundwater connectivity, infiltration, and recharge can be found in the section of this review on Standard 2.

No response required.

2.5

Standard 4: 80% TSS Removal

Stormwater management systems must be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:

- *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan and thereafter are implemented and maintained.*

- *Stormwater BMPs are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
- *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

Hatch reviewed the proposed infiltration systems for Standard 4, below are our findings and recommendations:

- ◆ Point-in-time groundwater measurements were provided for review and incorporated into the design to provide at least 2-feet of separation between the bottom of the infiltration structure and the ground water table. The applicant should provide and review the *seasonal high groundwater elevation*, as is required by the Massachusetts Stormwater Handbook, to determine if adequate separation between the groundwater table and the structures is available.

[BSC Group Response; January 24, 2024] Please see above comments relating to the determination of the estimated seasonal high groundwater elevation and the elevations that were used for the infiltration systems. The Massachusetts Stormwater Handbook notes in Volume 3, Chapter 1 that "Depth to seasonal high groundwater may be identified based on redox features in the soil." Where redox features were found to be higher than the observed groundwater in the test pit, the elevation of the redox features was taken to be the estimated seasonal high groundwater elevation to ensure that suitable separation to infiltration practices was provided. Test pit logs and groundwater elevations can be found in the Stormwater Report.

[Hatch response; February 7, 2024] No further comment, this comment may be considered closed. Additional discussion regarding the type of groundwater measurements is included in Section 2 section.

- Near the existing wetlands, the lowest surveyed elevation shown in the drawings is 3.0-feet. The water surface elevation of the wetland should correlate to the groundwater elevations observed in the test pits. The measured groundwater table varies locally by as much as 4.5-feet between measurements, which is concerning for infiltration as a stormwater management strategy.

[BSC Group Response; January 24, 2024] While the measurements of the groundwater table varied in elevation across the site, the highest estimated seasonal groundwater elevation (3.98) was used for the conservative design of all of the infiltration systems. This ensures that 2-feet of separation to groundwater will be provided at a minimum across the site. This elevation corresponds well to elevations at the bordering vegetated wetlands (BVW) and observed conditions in the BVW.

[Hatch response; February 7, 2024] No further comment. The comment may be considered closed.

-
- Infiltration as a stormwater practice is challenging for many stormwater site designs near wetlands due to high groundwater tables. Therefore, establishing the seasonal high groundwater table is extremely important.

[BSC Group Response; January 24, 2024] As noted in previous comments, the estimated high seasonal groundwater elevations were determined in accordance with the Massachusetts Stormwater Handbook.

[Hatch response; February 7, 2024] No further comment. The comment may be considered closed.

- The water surface elevation and regulatory water levels of the wetland should be labeled on the plans and in the Stormwater report.

[BSC Group Response; January 24, 2024] This information is not required under the Wetlands Protection Act and does not provide any discernable value to determining groundwater elevations. In addition, the term "regulatory water levels of the wetland" are not defined or included in the Wetlands Protection Act, so it is not clear what would be noted on the plans. As noted in responses above, groundwater elevations were determined in accordance with the requirements of the Stormwater Handbook in the Spring of 2023, and the most conservative value found was utilized for all infiltration systems on site.

[Hatch response; February 7, 2024] No further comment. The comment may be considered closed.

2.6

Standard 5: Higher Potential Pollutant Loads (HPPL)

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific stormwater BMPs determined by the Department to be suitable for such use as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

We concur with the applicant's stormwater report that Standard 5 is not applicable to the project site as the site use is not consistent with a land use with higher potential pollutant load (LUHPPL).

[BSC Group Response; January 24, 2024] No response required.

2.7

Standard 6: Critical Areas

Stormwater discharges to a Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or any other critical area require the use of the specific source control and pollution prevention measures and the specific stormwater best

management practices determined by the Department to be suitable for managing discharges to such area, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters or Special Resource Waters shall be set back from the receiving water and receive the highest and best practical method of treatment. A “stormwater discharge,” as defined in 314 CMR 3.04(2)(a)1. or (b), to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of the public water supply.

The Massachusetts DEP has not identified the project site as a(n):

- Outstanding Resource Water,
- Public water supply (Zone Is, Zone IIs and Interim Wellhead Protection),
- Bathing beach,
- Cold-water fishery, or a
- Shellfish growing area.

We concur with the applicant's stormwater report that Standard 6 is not applicable to the project site.

[BSC Group Response; January 24, 2024] No response required.

2.8

Standard 7: Redevelopment Projects

A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

We concur with the applicant's stormwater report that Standard 7 is not applicable to the project site as the project is a new development.

[BSC Group Response; January 24, 2024] No response required.

2.9

Standard 8: Erosion, Sediment Control

A plan to control construction-related impacts, including erosion sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan), must be developed and implemented.

Hatch completed a review of the construction drawings, including applicable notes, SWPPP sheet, and Section 3 of the Stormwater Report in accordance with the *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas*. Based on our review, we recommend the following:

- Street cleaning, such as street sweeping or shoveling, should be included to periodically remove sediment that may have been tracked out of the project site, beyond the

construction access. Street cleaning will be especially important following the saw cuts on Dorothy Road.

[BSC Group Response; January 24, 2024] The Construction Period Pollution Prevention Plan included in the Stormwater Report has been revised to include street cleaning at the end of each day as a requirement during construction.

[Hatch response; February 7, 2024] This comment is considered closed.

2.10 Standard 9: Operation and Maintenance Plan

A long-term operation and maintenance plan must be developed and implemented to ensure that stormwater management systems function as designed.

Hatch completed a review of the Operation and Maintenance Plan; based on our review, we recommend the following:

- Per Massachusetts Stormwater Standards, an estimate of the annual O&M budget shall be provided in Section 4.0 *Long-Term Pollution Prevention & Operation and Maintenance Plan* of the Stormwater Report.

[BSC Group Response; January 24, 2024] An estimated O&M budget has been added to the Long-Term Pollution Prevention and Operation and Maintenance Plan included in the Stormwater Report.

[Hatch response; February 7, 2024] This comment is considered closed.

- If using asphalt shingles on the townhomes, the loose grit be collected and disposed of, following construction, and prior to 6" roof drains being connected to infiltration basin.

[BSC Group Response; January 24, 2024] A note has been added to the Construction Period Pollution Prevention Plan included in the Stormwater Report (Section 3.7) that specifies that roof drains shall be connected to the infiltration basins after the area has been cleaned to prevent loose material from the shingles from entering the drainage system.

[Hatch response; February 7, 2024] This comment is considered closed.

- Long term operation and maintenance for the on-site infiltration basins (both Stormtrap and R-Tank^{XD} systems) must be provided. The O&M plan should include the following provisions:

- maintain an operation and maintenance log for the last three years, including inspections, repairs, replacement and disposal (for disposal, the log shall indicate the type of material and the disposal location).
- make this log available to MassDEP and the Conservation Commission upon request; and
- allow members and agents of the MassDEP and the Conservation Commission to enter and inspect the premises to evaluate and ensure that the responsibility party complies with the Operation and Maintenance Plan requirements for each BMP.

-
- As the stormwater BMPs serve more than one lot, the applicant shall include with the Notice of Intent a mechanism for implementing and enforcing the Operation and Maintenance Plan. The applicant shall identify the lots or units that will be serviced by the proposed stormwater BMPs. The applicant shall also provide a copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of stormwater BMPs.

[BSC Group Response; January 24, 2024] The provisions noted above have been added to the Operation and Maintenance Plan included in the Stormwater Report. Please note that O&M provisions for the infiltration systems were already in the O&M Plan under "Underground Infiltration System". In addition, it should be clarified that all of the buildings in the Project (the 62+ building as well as the town homes) will be located on the same lot with ownership structure as condominiums. The responsible party for maintenance will be the condominium association. Upon establishment of the association, specific contact information can be provided.

[Hatch response; February 7, 2024] This comment is considered closed.

2.11 Standard 10: Illicit Discharges

All illicit discharges to the stormwater management system are prohibited.

The review has not identified any proposed illicit discharges. We concur with the applicant's stormwater report that Standard 10 is not applicable to the project site.

[BSC Group Response; January 24, 2024] No response required.

An unsigned Illicit Discharge Compliance Statement was provided in the Notice of Intent. The Illicit Discharge Compliance Statement should be signed prior to this issuance of permits.

[BSC Group Response; January 24, 2024] The Illicit Discharge Compliance Statement included in the NOI will be signed by the property owner prior to the issuance of an Order of Conditions.

[Hatch response; February 7, 2024] This comment is considered closed.

2.12 Miscellaneous Comments

The following is a list of stormwater review comments that do not fit within the Massachusetts Stormwater Standards and do not require response from the applicant.

- Arlington Land Realty address report on the title page of Thorndike Place Notice of Intent drawing package is inconsistent with the address for the same reported in the other reviewed submittal packages.

[BSC Group Response; January 24, 2024] Addresses provided on the Site Plans reference an old address for Arlington Land Realty while all other documents reference the current address. If required, a final set of Site Plans with the current address can be provided prior to issuance of an Order of Conditions.

*N[Hatch response; February 7, 2024] o resubmittal to address this comment is required,
comment is considered closed.*



Ross Mullen

RM:RM

FEBRUARY 13, 2024

www.bscgroup.com

Town of Arlington Conservation Commission
c/o Mr. Ryan Clapp, Conservation Administrator
Robbins Memorial Town Hall
730 Massachusetts Avenue
Arlington, Massachusetts 02476

RE: Response to Additional Peer Review Comments, Hatch Engineering Thorndike Place Stormwater Peer Review

Dear Members of the Arlington Conservation Commission,

On behalf of the Applicant, Arlington Land Realty, LLC, BSC Group, Inc. (BSC) is pleased to submit this response to peer review comments provided by Hatch Associates Consultants, Inc. (Hatch) relative to the Thorndike Place residential development (the Project) to be located off of Dorothy Road in the Town of Arlington. Hatch has performed a peer review of the Project's stormwater management design pursuant to the Wetlands Protection Act on behalf of the Arlington Conservation Commission and issued comments in a memorandum dated February 7, 2024, titled *Town of Arlington, Thorndike Place Stormwater Review*. For clarity, we have repeated the original comments from Hatch's original peer review letter January 23, 2024, in standard text below utilizing the same numbering system, provided our previous response from a letter dated January 24, 2024, in *italics*, restated Hatch's updated February 7, 2024 comment in standard text with date, and, finally, provided final response where required in *italics with date*.

2.1 General Findings

- The applicant proposes to develop a 17.7-acre parcel, disturbing 4.02 acres and create 1.81 acres of impervious surfacing, leaving the remainder of the parcel under a Conservation Restriction (approximately 12 acres).

No response required.

- 5 infiltration systems, one infiltration chamber, and one bioretention basin/rainwater garden are proposed to provide stormwater treatment/management.

No response required.

- Alewife Brook runs through the southeast corner of this property. The Alewife Brook corridor includes wetlands, Bordering Lands Subject to Flood, Buffer Zone to Bordering Vegetated Wetlands, and FEMA floodplain/floodway.

Alewife Brook is not located on the property, but rather approximately 800-feet southeast of the property. The wetlands at the southeast corner of the property are hydraulically connected to the Little River/Alewife Brook via three culverts that run underneath Route 2.

[Hatch response; February 7, 2024] Noted, no additional action required.

BSC February 13, 2024: No response required.

2.2 Standard 1: Untreated Discharges

- Stormwater runoff from the eastern portion of the senior living building (approximately 14,800 square feet) is directed to a rip-rap apron that drains to a nearby wetland. The applicant should verify discharge from this roof, during extreme events, will not cause erosion and sedimentation into the wetland.

This rip-rap apron has been sized to accommodate the peak flow associated with the 100-year storm from the outlet pipe for this portion of the roof runoff, such that there will be no erosion or scour. Please see Section 6.04 of the Stormwater Report for the rip-rap apron sizing calculations and Sheet C-202 for the detail of Flared End Section w/Stone Protection (Dissipation Bowl). For reference, the roof drain in question utilized flared end FES2.

[Hatch response; February 7, 2024] Based on conversation on February 6, 2024 facilitated by Chuck Tirone between the BSC Group and Hatch, the BSC group will verify that there is not erosion caused by runoff after it has discharged from the riprap apron.

BSC February 13, 2024: BSC has modeled the rip-rap outlet protection at this location in HydroCAD. As shown in the attached calculations, discharge from this outlet protection in the 100-year storm event will be at a velocity of 1.71 feet per second (fps). This velocity for the largest storm event analyzed is non-erosive for the vegetated areas downstream of the outlet protection.

2.3 Standard 2: Peak Rate Control and Flood Prevention

- Surficial fill soils were designated as Hydrologic Soil Group C, and infiltration rates (0.52 inches/hour) were selected to be on the edge of published values for HSG C those soils, based varying composition of sandy loam, fine sandy loam and gravelly sandy loam.

No response required.

- FEMA Technical Bulletin 6-93, Below-Grade Parking Requirements for Buildings Located in Special Flood Hazard Areas, clarified FEMA's policy that below grade parking is consistent with their definition of a basement, and that construction of the lowest floor (including basements) below the base flood elevation is prohibited for residential buildings. The FEMA base flood elevation "100-year" is 6.8-feet. As the building is proposed to be used for senior living residences and the proposed floodplain is adjacent to the structure, the proposed underground garage with elevation of 6.0-feet is below the base flood elevation (plus applicable freeboard and floodway surcharge requirements). Therefore, the proposed garage has a significant flood risk, as identified by FEMA.

While the FEMA Technical Bulletin is not specifically applicable to a review under the Wetlands Protection Act and MassDEP's Stormwater Standards, it prohibits "the construction of below-grade parking garages...beneath residential buildings in Zones A1-A30, AE, and AH." Construction of the senior living building includes filling in the portions of the flood plain and, ultimately, altering its limits. The building will be constructed such that it is entirely outside the limits of the 6.8-foot base flood elevation (BFE). Therefore, construction of a garage beneath this building is allowed. A FEMA Elevation Certificate will be prepared for all buildings at the conclusion of construction demonstrating that all buildings are located above BFE. In addition, all below-grade areas in all buildings will be appropriately waterproofed to prevent groundwater intrusion.

[Hatch response; February 7, 2024] The scope of this review was for all facets of stormwater management. Our accepted proposal states that we will review the project based on industry best practices, Wetland Protection Act, and the Massachusetts Stormwater Handbook. Specifically, our accepted proposal also states that we will complete a review as to the Code of Federal Regulations in regards to the floodplain and that will review the FEMA Floodplain/floodway encroachments as well as CLOMR/LOMR/no-rise documents. Further, the Mass.gov webpage lists the Massachusetts Wetland Protection Act as one regulation and practice that is part of floodplain management. As the Town of Arlington participates in the National Flood Insurance Program, it therefore must abide by the applicable rules and regulations stemming from CFR 60.3.

Based on conversation on February 6, 2024 facilitated by Chuck Tirone between the BSC Group and Hatch, fill is being used to raise the existing structure and separate it from the FEMA floodplain. FEMA NFIP Technical Bulletin 10, published in March 2023, "Reasonably Safe from Flooding Requirement for Building on Filled Land" provides guidance on this topic. Our understanding is that the use of any type of fill to remove a building from the Special Flood Hazard Area (SFHA) requires the LOMR-F, instead of a FEMA Elevation Certificate. Further, our understanding is that FEMA requires the removal of the land from the SFHA before a basement, excavated into fill, is built below the base flood elevation using a LOMR-F process. It is our understanding that the FEMA then also requires a technical analysis showing the basement (garage) is reasonably safe from flooding and the Town of Arlington's designated local floodplain administrator to sign FEMA's Community Acknowledgement Form. The Town of Arlington's continued participation in the National Flood Insurance Program, with the significant benefit of subsidized flood insurance to its residents, requires it to comply with federal standards.

BSC February 13, 2024: The project will comply with all FEMA requirements. If a LOMR-F is required per FEMA regulations, one will be submitted in accordance with all applicable requirements. As previously stated, these requirements are not applicable to review and permitting under the Wetlands Protection Act. As such, the Hatch comment is noted and will be addressed with the appropriate permitting entities.

- The proposed basement elevations of the townhomes (elevation 3.0-feet) are 3.8-feet below the FEMA 100-year flood elevation of 6.8-feet. The proposed separation between these structures appears to be as little as 115-feet. A groundwater mounding analysis of the regional flood along Alewife Brook should be assessed to verify that groundwater intrusion from flooding along the watercourse does not impact the basements of the townhome structures. Note that this is distinct from the completed groundwater mounding analysis of the infiltration basins.

A mounding analysis of the regional flood along Alewife Brook is not a requirement under the Wetlands Protection Act and potential basement groundwater intrusion does not fall under the WPA jurisdiction. Additionally, as referenced in our response above, the proposed site work will result in all buildings being located outside the FEMA 100-year BFE and below-grade areas in all buildings will be appropriately waterproofed to prevent groundwater intrusion.

[Hatch response; February 7, 2024] This is a preference comment and can be considered closed.

BSC February 13, 2024: No response required.

- Proposed ACF R-Tank^{XD}'s between the townhome units are nearly adjacent to the foundations of these structures with basements. The bottom of the chambers of these units are proposed to be at 6.0-feet (with bottom of stone at 5.67-feet), with the basement elevation of the adjacent townhomes at 3.0-feet. When these basins are filled with stormwater runoff, seepage will likely occur adjacent to the basement foundation wall, which will act as a preferential flow path (planar surface) with least resistance downward. Groundwater intrusion flood risk and seepage from these infiltration systems represents a concerning flood risk.

See previous response to comments regarding waterproofing of buildings.

[Hatch response; February 7, 2024] No further action, the comment may be considered closed. Additional discussion on separation between groundwater elevation and basements is included in the subsequent bullet.

BSC February 13, 2024: No response required.

- Test Pit #1 (2023), located at the proposed ACF R-Tank^{XD} between the westernmost two townhome units, measured a point-in-time groundwater elevation of 1.5-feet, while the proposed basement elevations are at 3.0-feet. The Town of Arlington Zoning Bylaws Section 5.6.8.A (2) state that for sites within an Inland Wetland District, at least 4.0-feet of separation should be provided between the floor of the occupied levels and the seasonal high-water table.

As mentioned in previous comments, the basements of the buildings will be waterproofed to prevent intrusion of groundwater. We also note that project was reviewed and permitted as to local regulations in effect at the date of submittal of the Comprehensive Permit application. This comment references a more recent version of the Zoning Bylaws, and further is not relevant to the stormwater review under the Wetlands Protection Act.

[Hatch response; February 7, 2024] Based on conversation on February 6, 2024 facilitated by Chuck Tirone between the BSC Group and Hatch, we understand that the Comprehensive Permit application was completed and the basement elevations approved prior to this stormwater peer review. The comment may be considered closed.

As a best practice, FEMA advises against construction of basements below the FEMA flood elevation (see Technical Bulletin #10 above) and established groundwater tables as these structures may be prone to damage by hydrostatic pressures and/or groundwater seepage. and note that construction.

A point of clarification, during the site visit, Hatch staff were informed that groundwater elevations were based on readings from “monitoring locations”. We now understand that the groundwater elevations are based on redox methods. As the margin for error is so close between the groundwater elevations and 1. The basement elevations and the seasonal high groundwater table and 2. The required separation between the infiltration feature bottoms and the seasonal high groundwater table, it is incumbent on the Hatch team to thoroughly review the established groundwater elevations as well as any discrepancies.

BSC February 13, 2024: Design of basements and applicable waterproofing systems will be performed during the final building design of the townhouses and submitted with building permit plans per standard industry practices. As previously stated, these requirements are not applicable to review and permitting under the Wetlands Protection Act. As such, the Hatch comment is noted and will be addressed with the appropriate permitting entities.

- Test Pits #2 and #4 pose similar challenges between the proposed basement elevation (3.0 feet) and insufficient separation to the groundwater table, located at 0.8 and 1.5-feet, respectively.

See response to above comments.

[Hatch response; February 7, 2024] No further action, the comment may be considered closed. Additional discussion on separation between groundwater elevation and basements is included in the previous bullet.

BSC February 13, 2024: No response required.

- Test Pits #3 and #5 (2023) measured point-in-time groundwater elevations (3.5 and 4.0-feet, respectively) above the proposed basement elevations of adjacent townhomes (3.0-feet).

See response to above comments.

[Hatch response; February 7, 2024] No further action, the comment may be considered closed. Additional discussion on separation between groundwater elevation and basements is included in the bullet two above.

BSC February 13, 2024: No response required.

- Note that the seasonal high groundwater table may be higher than the 2023 point-in-time measurements and increase flood risk. Additionally, construction of a sump pump system, to mitigate flooding/groundwater intrusion, at any of these residences could lower the regional groundwater table.

See response to above comments regarding waterproofing of basement areas. Use of or need for sump pumps has not yet been determined. Should sump pumps be proposed, they will be included in final plans and building permit plans submitted in accordance with the Comprehensive Permit for the Project.

[Hatch response; February 7, 2024] No further action. Comment may be considered closed.

BSC February 13, 2024: No response required.

2.4 Standard 3: Recharge to Ground Water

- Test Pits #7 and #8 (2023) measured point-in-time groundwater elevations of 0.5 and 2.2, respectively. These test pits lie beneath the proposed Stormtrap infiltration system with a proposed bottom elevation of 6.0-feet. Massachusetts Stormwater guidelines state that at least two feet of separation shall be provided between the *seasonal high groundwater elevation* and the bottom of an infiltration structure. Based on our understanding from the site visit, the 2023 groundwater elevations were collected in May. We recommend collection of additional groundwater information, especially during the spring, to verify this standard is met.

The highest estimated groundwater elevation on site was found to be 3.98 and was based on the highest observed redoxomorphic features in the soil, which were found in Test Pit #5. All infiltration systems on site were designed with a bottom elevation of 6.0 to provide a minimum of 2-feet of separation to this estimated seasonal high groundwater elevation (ESHWG). The test pits were conducted in Spring (May) of 2023 in coordination with the Town of Arlington Engineering and Conservation Departments and accepted practice under the Wetlands Protection Act, and consistent with the groundwater testing window set out within the Comprehensive Permit. It has been confirmed from USGS that streamflow conditions were within the normal range and that there were not drought conditions in this area at that time. Test pit logs and groundwater elevations can be found in the Stormwater Report. Locations of test pits are shown on the Site Grading and Drainage Plan.

[Hatch response; February 7, 2024] The groundwater of the Stormtrap ST1 infiltration device should be reviewed. Based on simplified methods, Hatch expects approximately 2-3 feet of groundwater mounding beneath this basin for the design storms.

BSC February 13, 2024: It is unclear exactly how Hatch has determined their groundwater mounding estimates or what is meant by “simplified methods”. As part of the Stormwater Report, BSC performed a groundwater mounding analysis using the Hantush Method, which is the only methodology specifically referenced in the DEP Stormwater Handbook (see Volume 3, Chapter 1, Mounding Analysis). The mounding analysis was performed to demonstrate that the groundwater mound resulting from the required recharge volume does not break out above the land or water surface of a wetland as required. It should also be noted that the methodology used in our analysis is the exact same as was used during the Comprehensive Permit process and extensively peer reviewed and accepted by BETA Group working on behalf of the Town of Arlington.

- Additional comments regarding groundwater connectivity, infiltration, and recharge can be found in the section of this review on Standard 2.

No response required.

2.5 Standard 4: 80% TSS Removal

- Point-in-time groundwater measurements were provided for review and incorporated into the design to provide at least 2-feet of separation between the bottom of the infiltration structure and the ground water table. The applicant should provide and review the seasonal high groundwater elevation, as is required by the Massachusetts Stormwater Handbook, to determine if adequate separation between the groundwater table and the structures is available.

Please see above comments relating to the determination of the estimated seasonal high groundwater elevation and the elevations that were used for the infiltration systems. The Massachusetts Stormwater Handbook notes in Volume 3, Chapter 1 that “Depth to seasonal high groundwater may be identified based on redox features in the soil.” Where redox features were found to be higher than the observed groundwater in the test pit, the elevation of the redox features was taken to be the estimated seasonal high groundwater elevation to ensure that suitable separation to infiltration practices was provided. Test pit logs and groundwater elevations can be found in the Stormwater Report.

[Hatch response; February 7, 2024] No further comment, this comment may be considered closed. Additional discussion regarding the type of groundwater measurements is included in Section 2 section.

BSC February 13, 2024: No response required.

- Near the existing wetlands, the lowest surveyed elevation shown in the drawings is 3.0-feet. The water surface elevation of the wetland should correlate to the groundwater elevations observed in the test pits. The measured groundwater table varies locally by as much as 4.5-feet between measurements, which is concerning for infiltration as a stormwater management strategy.

While the measurements of the groundwater table varied in elevation across the site, the highest estimated seasonal groundwater elevation (3.98) was used for the conservative design of all of the infiltration systems. This ensures that 2-feet of separation to groundwater will be provided at a minimum across the site. This elevation corresponds well to elevations at the bordering vegetated wetlands (BVW) and observed conditions in the BVW.

[Hatch response; February 7, 2024] No further comment. The comment may be considered closed.

BSC February 13, 2024: No response required.

- Infiltration as a stormwater practice is challenging for many stormwater site designs near wetlands due to high groundwater tables. Therefore, establishing the seasonal high groundwater table is extremely important.

As noted in previous comments, the estimated high seasonal groundwater elevations were determined in accordance with the Massachusetts Stormwater Handbook.

[Hatch response; February 7, 2024] No further comment. The comment may be considered closed.

BSC February 13, 2024: No response required.

- The water surface elevation and regulatory water levels of the wetland should be labeled on the plans and in the Stormwater Report.

This information is not required under the Wetlands Protection Act and does not provide any discernable value to determining groundwater elevations. In addition, the term "regulatory water levels of the wetland" are not defined or included in the Wetlands Protection Act, so it is not clear what would be noted on the plans. As noted in responses above, groundwater elevations were determined in accordance with the requirements of the Stormwater Handbook in the Spring of 2023, and the most conservative value found was utilized for all infiltration systems on site.

[Hatch response; February 7, 2024] No further comment. The comment may be considered closed.

BSC February 13, 2024: No response required.

2.6 Standard 5: Higher Potential Pollutant Loads (HPPL)

- We concur with the applicant's stormwater report that Standard 5 is not applicable to the project site as the site use is not consistent with a land use with higher potential pollutant load (LUHPPL).

No response required.

2.7 Standard 6: Critical Areas

- The Massachusetts DEP has not identified the project site as a(n):

- Outstanding Resource Water,
- Public water supply (Zone IIs, Zone IIIs and Interim Wellhead Protection),
- Bathing beach,
- Cold-water fishery,

- Shellfish growing area.

We concur with the applicant's stormwater report that Standard 6 is not applicable to the project site.

No response required.

2.8 Standard 7: Redevelopment Projects

- We concur with the applicant's stormwater report that Standard 7 is not applicable to the project site as the project is a new development.

No response required.

2.9 Standard 8: Erosion, Sediment Control

- Street cleaning, such as street sweeping or shoveling, should be included to periodically to remove sediment that may have been tracked out of the project site, beyond the construction access. Street cleaning will be especially important following the saw cuts on Dorothy Road.

The Construction Period Pollution Prevention Plan included in the Stormwater Report has been revised to include street cleaning at the end of each day as a requirement during construction.

[Hatch response; February 7, 2024] This comment is considered closed.

BSC February 13, 2024: No response required.

2.10 Standard 9: Operation and Maintenance Plan

- Per Massachusetts Stormwater Standards, an estimate of the annual O&M budget shall be provided in Section 4.0 *Long-Term Pollution Prevention & Operation and Maintenance Plan* of the Stormwater Report.

An estimated O&M budget has been added to the Long-Term Pollution Prevention and Operation and Maintenance Plan included in the Stormwater Report.

[Hatch response; February 7, 2024] This comment is considered closed.

BSC February 13, 2024: No response required.

- If using asphalt shingles on the townhomes, the loose grit be collected and disposed of, following construction, and prior to 6" roof drains being connected to the infiltration basin.

A note has been added to the Construction Period Pollution Prevention Plan included in the Stormwater Report (Section 3.7) that specifies that roof drains shall be connected to the infiltration basins after the area has been cleaned to prevent loose material from entering the drainage system.

[Hatch response; February 7, 2024] This comment is considered closed.

BSC February 13, 2024: No response required.

- Long term operation and maintenance for the on-site infiltration basins (both Stormtrap and R-Tank^{XD} systems) must be provided. The O&M Plan should include the following provisions:

- maintain an operation and maintenance log for the last three years, including inspections, repairs, replacement and disposal (for disposal, the log shall indicate the type of material and the disposal location),
- make this log available to MassDEP and the Conservation Commission upon request; and
- allow members and agents of the MassDEP and Conservation Commission to enter and inspect the premises to evaluate and ensure that the responsibility party complies with the Operation and Maintenance Plan requirements for each BMP.
- As the stormwater BMPs serve more than one lot, the applicant shall include with the Notice of Intent a mechanism for implementing and enforcing the Operation and Maintenance Plan. The

applicant shall identify the lots or units that will be serviced by the proposed stormwater BMPs. The applicant shall also provide a copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of the legal responsibility for the operation and maintenance of stormwater BMPs.

The provisions noted above have been added to the Operation and Maintenance Plan included in the Stormwater Report. Please note that O&M provisions for the infiltration systems were already in the O&M Plan under "Underground Infiltration System". In addition, it should be clarified that all of the buildings in the Project (the 62+ building as well as the town homes) will be located on the same lot with ownership structure as condominiums. The responsible party for maintenance will be the condominium association. Upon establishment of the association, specific contact information can be provided.

[Hatch response; February 7, 2024] This comment is considered closed.

BSC February 13, 2024: No response required.

2.11 Standard 10: Illicit Discharges

- The review has not identified any proposed illicit discharges. We concur with the applicant's stormwater report that Standard 10 is not applicable to the project site.
No response required.
- An unsigned Illicit Discharge Compliance Statement was provided in the Notice of Intent. The Illicit Discharge Compliance Statement should be signed prior to this issuance of permits.

The Illicit Discharge Compliance Statement included in the NOI will be signed by the property owner prior to the issuance of an Order of Conditions.

[Hatch response; February 7, 2024] This comment is considered closed.

BSC February 13, 2024: No response required.

2.12 Miscellaneous Comments

- Arlington Land Realty address report on the title page of the Thorndike Place Notice of Intent drawing package is inconsistent with the address for the same reported in other reviewed submittal packages.
Addresses provided on the Site Plans reference an old address for Arlington Land Realty while all other documents reference the current address. If required, a final set of Site Plans with the current address can be provided prior to issuance of an Order of Conditions.

[Hatch response; February 7, 2024] No resubmittal to address this comment is required, comment is considered closed.

BSC February 13, 2024: No response required.

We believe that these responses fully respond to all open comments from the stormwater peer review. We look forward to discussing this project with you further at the upcoming public hearings on the project. Please feel



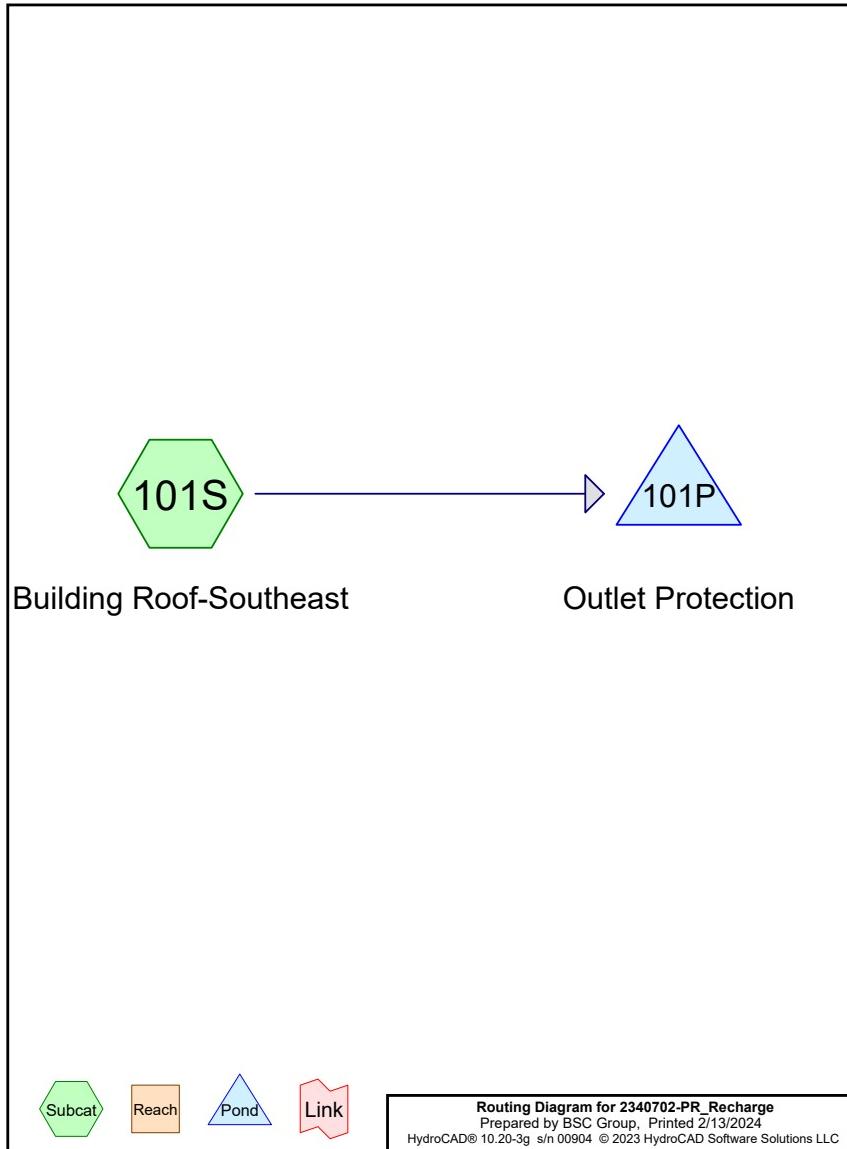
free to contact me at (617) 896-4386 or drinaldi@bscgroup.com should you have any questions on the information in this report.

Sincerely,
BSC GROUP, INC.

A handwritten signature in black ink, appearing to read 'D. Rinaldi'.

Dominic Rinaldi, PE
Senior Associate

Attachments: Velocity Calculations for Roof Discharge



Velocity Calculation for Roof Discharge
2340702-PR_Recharge
 Prepared by BSC Group
 HydroCAD® 10.20-3g s/n 00904 © 2023 HydroCAD Software Solutions LLC

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 Page 2

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100-Year	Type III 24-hr		Default	24.00	1	11.50	2

2340702-PR_Recharge

Prepared by BSC Group

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Velocity Calculation for Roof Discharge

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Page 3

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
14,140	98	Roofs, HSG C (101S)

Velocity Calculation for Roof Discharge

Type III 24-hr 100-Year Rainfall=11.50"

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Page 4

2340702-PR_Recharge

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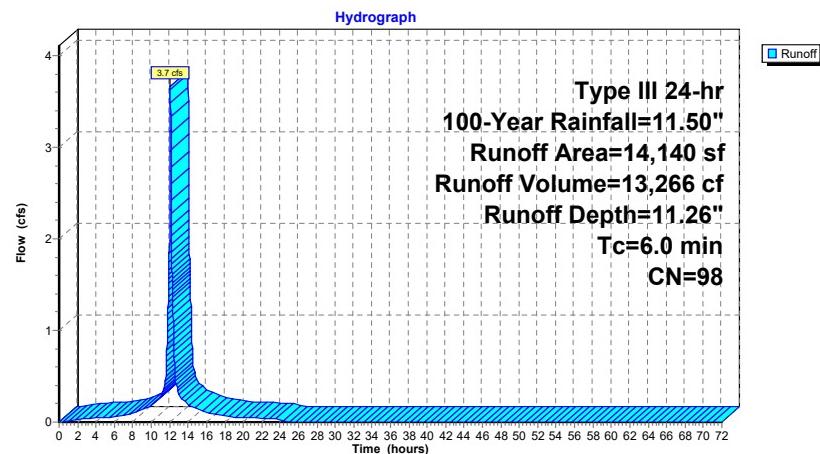
Summary for Subcatchment 101S: Building Roof-Southeast

Runoff = 3.7 cfs @ 12.08 hrs, Volume= 13,266 cf, Depth=11.26"
 Routed to Pond 101P : Outlet Protection

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=11.50"

Area (sf)	CN	Description
14,140	98	Roofs, HSG C
14,140		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Tc

Subcatchment 101S: Building Roof-Southeast

2340702-PR_Recharge

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Velocity Calculation for Roof Discharge
Type III 24-hr 100-Year Rainfall=11.50"

Printed 2/13/2024

Page 5

Summary for Pond 101P: Outlet Protection

Inflow Area = 14,140 sf, 100.00% Impervious, Inflow Depth = 11.26" for 100-Year event
 Inflow = 3.7 cfs @ 12.08 hrs, Volume= 13,266 cf
 Outflow = 3.7 cfs @ 12.08 hrs, Volume= 13,250 cf, Atten= 0%, Lag= 0.0 min
 Primary = 3.7 cfs @ 12.08 hrs, Volume= 13,250 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 7.43' @ 12.08 hrs Surf.Area= 23 sf Storage= 16 cf

Plug-Flow detention time= 1.7 min calculated for 13,250 cf (100% of inflow)
 Center-of-Mass det. time= 0.8 min (738.0 - 737.2)

Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	16 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6.00	9	0	0
7.00	23	16	16

Device	Routing	Invert	Outlet Devices
#1	Primary	7.00'	5.0' long x 2.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=3.7 cfs @ 12.08 hrs HW=7.43' (Free Discharge)
 ↑=Broad-Crested Rectangular Weir(Weir Controls 3.7 cfs @ 1.71 fps)

1.71 ft/sec is a non-erosive velocity for vegetated areas downstream of the outlet protection

2340702-PR_Recharge

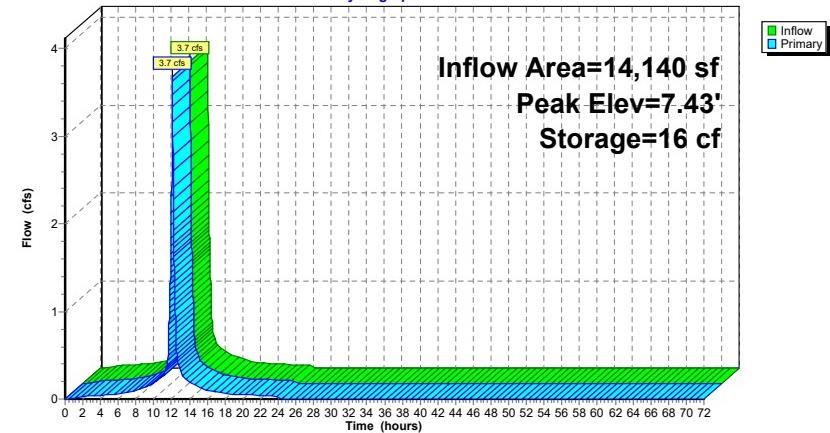
Prepared by BSC Group

HydroCAD® 10.20-3g s/n 00904 © 2023 HydroCAD Software Solutions LLC

Velocity Calculation for Roof Discharge
Type III 24-hr 100-Year Rainfall=11.50"

Printed 2/13/2024

Page 6

Pond 101P: Outlet Protection**Hydrograph**

Scott Horsley
Water Resources Consultant
39 Chestnut Street • Boston, MA 02108 • 508-364-7818

February 7, 2024

Mr. Charles Tirone, Chairperson
Town of Arlington
Conservation Commission
730 Massachusetts Avenue
Arlington, MA 02476

RE: Thorndike Place

Dear Chairperson Tirone and Conservation Commissioners:

I am writing this letter as a follow-up to the last Conservation Commission hearing on February 1, 2024 at the request of my clients, the Arlington Land Trust. We are very concerned about the current stormwater design associated with the project and the continuing lack of critical hydrologic data that is required, but not provided by the Applicant. We believe that it is critical that this data be collected during the next three months (March, April, and May) which represent seasonal high groundwater conditions.

As was stated at the last hearing the Applicant proposes to rely upon mottling (redox) markings at Test Pit 5 which is located approximately 150 feet outside of the proposed infiltration system #1 and to ignore/discount the mottling (redox) features noted at Test Pit 7 (that is located within the footprint of the proposed infiltration system #1) – see figure 1.

The MADEP Stormwater Handbook provides clear procedures about test pits and how to document estimated seasonal high groundwater (ESHGW) conditions. The Conservation Commission should assert these principles and have the applicant fully comply. I will summarize these two requirements below and am providing the full text of the MADEP document with highlighted sections as a reference attached to this letter. I am also providing a third comment/question requesting clarification/explanation from the applicant regarding their groundwater mounding analysis.

1. The MADEP Stormwater Handbook requires that test pits be provided at the actual location of each proposed infiltration system. Specifically, the Handbook states, “*Conduct tests at the point where recharge is proposed. The tests are a field evaluation conducted in the actual location and soil layer where stormwater infiltration is proposed...*”¹. The applicant’s suggestion

¹ MADEP Stormwater Handbook, Volume 3, Chapter 1, *Documenting Compliance with the Massachusetts Stormwater Management Standards*, page 10.

to use the data from Test Pit 5 (150 feet outside of the infiltration location) is not compliant and inconsistent with the MADEP Stormwater Handbook.

2. Additional information for the estimated seasonal high groundwater levels (ESHGW) needs to be provided at the proposed infiltration locations. Estimated seasonal high groundwater (ESHGW) levels are required for the design of the proposed stormwater infiltration systems. The MADEP Stormwater Standards require at least two feet of vertical separation between the bottom of the infiltration facilities and the ESHGW elevation.

The Applicant has not provided clear evidence for ESHGW levels at the proposed infiltration system locations. Additionally, and as stated in my previous comment letter, some of the ESHGW levels that have been provided by the Applicant are inconsistent with wetland elevations and each other.

The MADEP Stormwater Handbook, Volume 3 provides procedures about how to determine ESHGW elevations. It states, "*Seasonal high groundwater represents the highest groundwater elevation. Depth to seasonal high groundwater may be identified based on redox features in the soil (see Fletcher and Venneman listed in References). When redox features are not available, installation of temporary push point wells or piezometers should be considered. Ideally, such wells should be monitored in the spring when groundwater is highest and results compared to nearby groundwater wells monitored by the USGS to estimate whether regional groundwater is below normal, normal, or above normal (see: <http://ma.water.usgs.gov>)*".²

The Applicant is suggesting that the redox features noted at Test Pit 7 are not reliable, therefore the MADEP Stormwater Handbook indicates that they should install wells (peizometers) and measure water levels and compare these levels to USGS index wells.

Recommendation: Require the applicant to install monitoring wells at the infiltration locations and measure groundwater levels throughout the March, April, and May period. Compare the recorded water levels with USGS index wells.

3. The Applicant's groundwater mounding analysis relies upon a modeled infiltration duration of 0.46 days (1.1 hours) to simulate the impacts of a 24-hour design storm. The Stormwater Report does not provide an explanation for this apparent discrepancy. The MADEP Stormwater Handbook requires that the groundwater mounding analysis be conducted for the 24-hour design storms (10, 25, and 100-year events). These storms by definition have a duration of 24 hours. The submitted groundwater mounding analysis was conducted for a duration of 1.1 hours (see figure 2). This suggests to me that the groundwater modeling therefore significantly underestimates the groundwater mounding associated with the proposed project.

² MADEP, Stormwater Handbook, Volume 3: Documenting Compliance with the Massachusetts Stormwater Management Standards, page 12.

Recommendation: Request the applicant to provide a written explanation of their groundwater modeling and specifically why they selected a 0.46 day (1.1 hour) duration.

Thank you for the opportunity to submit these additional comments and recommendations. We strongly urge the Conservation Commission to require the applicant to fully comply with the MADEP Stormwater Handbook. Please contact me directly with any questions that you might have.

Sincerely,

Scott W. Horsley
Water Resources Consultant

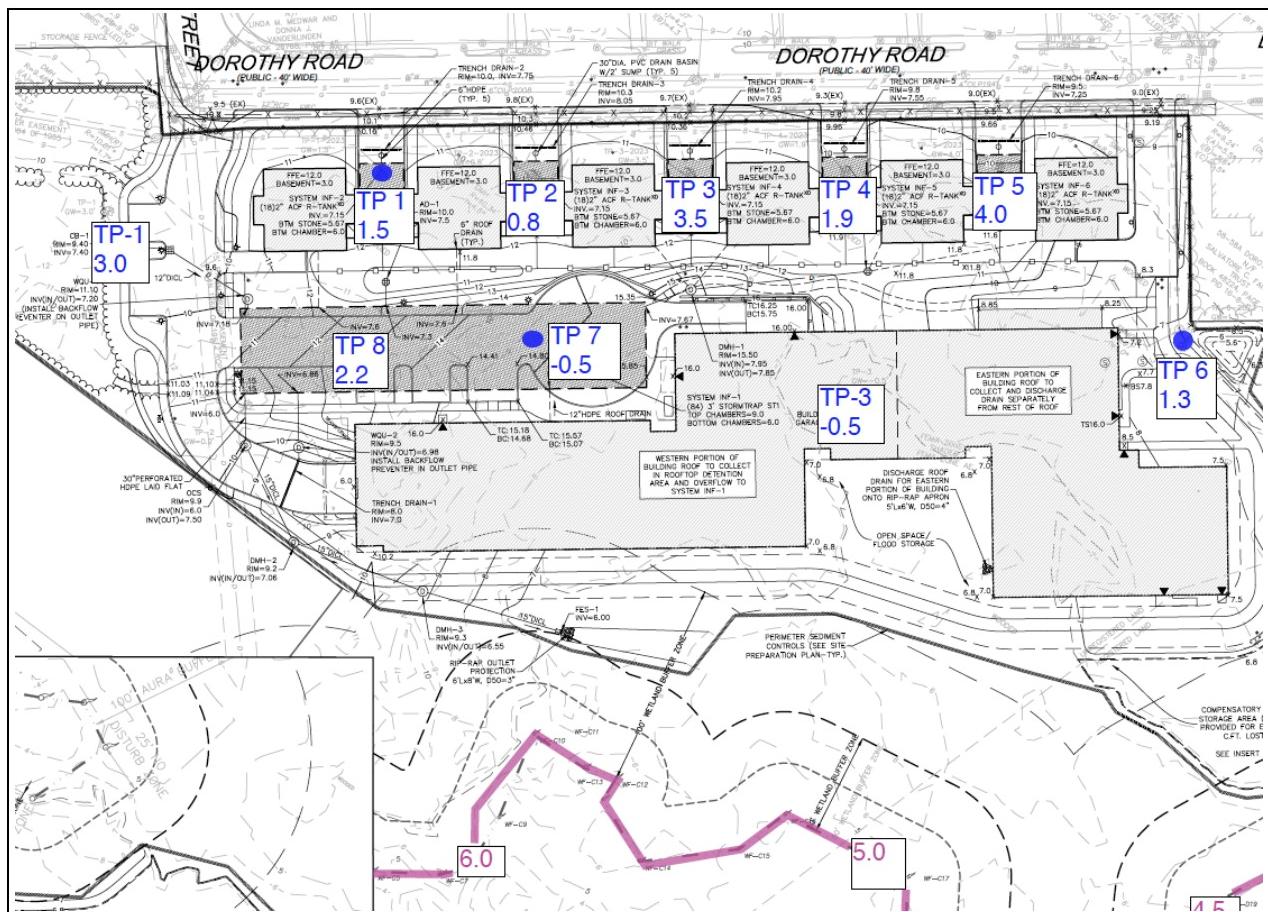


Figure 1 – Site Plan Hydrology (Groundwater Levels -Blue, Wetlands Elevations - Green)

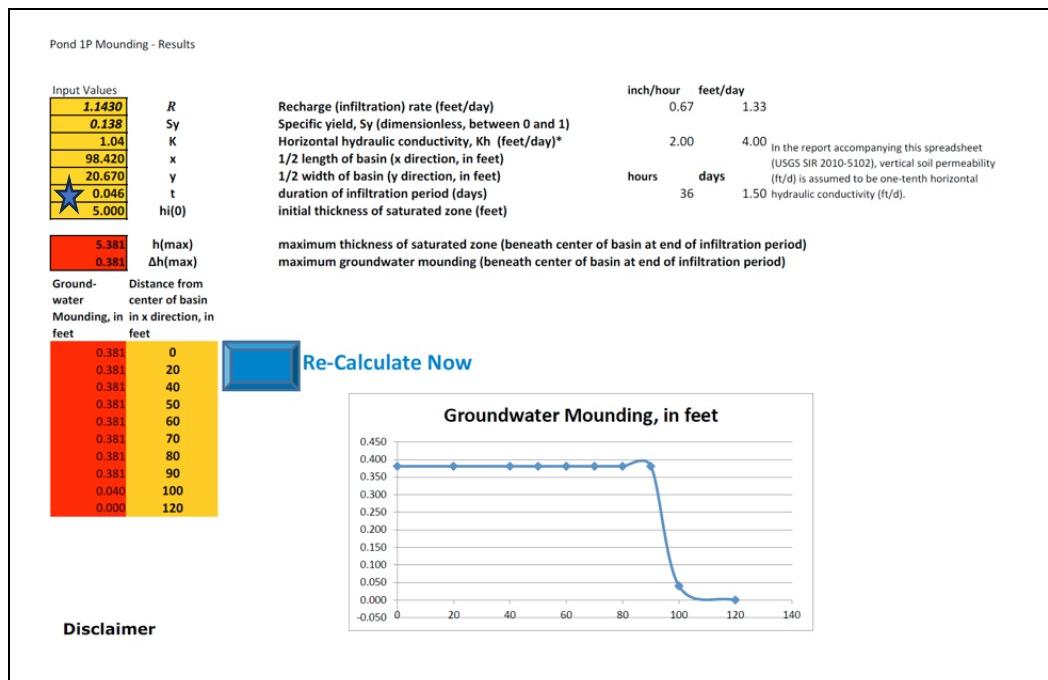


Figure 2 – Hantush Model Results (Duration 0.46 Days - BSC, Stormwater Report, Revised September 2023)

Project Memo

H373095

2024-02-07

To: Mr. Ryan Clapp and Mr. David Morgan,
Environmental Planner + Conservation
Agent

From: Ross Mullen

cc: Duke Bitsko, Rob Kenneally, and Chris
Ghormley

**Town of Arlington
Thorndike Place Stormwater Review****Thorndike Place Stormwater Review****1. Project Overview**

The Town of Arlington contracted with Hatch Associates Consultants, Inc. (Hatch) to complete a third-party stormwater review of the proposed Thorndike Place development on December 19, 2023.

1.1 General Information

Project Location: Dorothy Road between Route 2/Concord Turnpike on the south, existing residential neighborhoods to the north and west, and Thorndike Park to the east within the Town of Arlington, Massachusetts.

Project Purpose: Construct a rental and ownership community of 12-multifamily homes within six duplex buildings and a 124-unit senior-living residential apartment building complex. The construction is proposed on a 17.7-acre parcel with 12-acres proposed to be preserved as open space under a Conservation Restriction.

Impaired Waterbodies within 1 Mile of Proposed Project:

- Little River (MA71-21) for Debris, Water Chestnut, Chloride, Copper in Sediment, Dissolved Oxygen, Enterococcus, E. Coli, Flocculant Masses, Lead in Sediment, Odor, Oil and Grease, PCBs in Fish Tissue, Total Phosphorus, Scum/Foam, Transparency/Clarity, and Trash.
- Clay Pit Pond (MA71011): Chlordane in Fish Tissue.
- Black's Nook (MA71005): Water Chestnut, Nutrient/Eutrophication Biological Indicators, and Transparency/Clarity.
- Alewife Brook (MA71-20) for Debris, Water Chestnut, Chloride, Copper in Sediment, Dissolved Oxygen, Enterococcus, E. Coli, Flocculant Masses, Lead in Sediment, Odor, Oil and Grease, PCBs in Fish Tissue, Total Phosphorus, Scum/Foam, Sediment Bioassay, Transparency/Clarity, and Trash.

If you disagree with any information contained herein, please advise immediately.
H373095-0000-222-030-0001, Rev. A

Page 1
264 of 291

- Little Pond (MA71024) for Water Chestnut and Harmful Algal Blooms.
- Spy Pond (MA71040) for Curly-leaf pondweed, Eurasian Water Milfoil, *Myriophyllum Spicatum*, Water Chestnut, Chlordane in Fish Tissue, DDT in Fish tissue, Dissolved Oxygen, Harmful Algal Blooms, and Total Phosphorus.

TMDLs: None (other reaches of Alewife Brook have been included in TMDL studies).

Contact Information:

Contact Information	Applicant	Applicant's Agent
Company Name	Arlington Land Realty, LLC	BSC Group, Inc.
Attention	Peter Mugar	Dominic Rinaldi, PE
Address	116 Huntington Avenue Boston, MA 02116	803 Summer Street Boston, MA 02127
Phone	617-459-9587	617-896-4386
Email	psmugar@gmail.com	drinaldi@bscgroup.com

Reviewed Submittals:

1. *Thorndike Place Residential Community Notice of Intent Cover Letter*; prepared by Dominic Rinaldi of the BSC Group, Inc. on behalf of Arlington Land Realty, LLC; dated September 6, 2023.
2. *Thorndike Place Residential Community Notice of Intent*; prepared for Arlington Land Realty LLC by BSC Group; submitted to the Town of Arlington Conservation Commission; dated September 2023.
3. *Stormwater Report Thorndike Place Dorothy Road Arlington, MA*; prepared by BSC Group for Arlington Land Realty, LCC November 2020, revised August 2021, revised September 2023; dated September 5, 2023.
4. *Thorndike Place Notice of Intent* drawing package; prepared for Arlington Land Realty, LLC by BSC Group, dated September 6, 2023.

2. Findings

The following are Hatch's findings on the Thorndike Place stormwater site design based on our professional judgement and in accordance with the Massachusetts Stormwater Handbook and Stormwater Standards (2008).

2.1 General Findings

The following are a list of general findings and observations:

- The applicant proposes to develop a 17.7-acre parcel, disturbing 4.02 acres and create 1.81-acres of impervious surfacing, leaving the remainder of the parcel under a Conservation Restriction (approximately 12 acres).
No response required.
- 5 infiltration systems, one infiltration chamber, and one bioretention basin/rainwater garden are proposed to provide stormwater treatment/management.
No response required.
- Alewife Brook runs through the southeast corner of this property. The Alewife Brook corridor includes wetlands, Bordering Lands Subject to Flood, Buffer Zone to Bordering Vegetated Wetlands, and FEMA floodplain/floodway.

[BSC Group Response; January 24, 2024] Alewife Brook is not located on the property, but rather approximately 800-feet southeast of the property. The wetlands at the southeast corner of the property are hydraulically connected to the Little River/Alewife Brook via three culverts that run underneath Route 2.

[Hatch response; February 7, 2024] Noted, no additional action required.

2.2 Standard 1: Untreated Discharges

No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

Hatch completed a review of the design relative to Standard 1; the following is a list of our findings:

- Stormwater runoff from the eastern portion of the senior living building (approximately 14,800 square-feet) is directed to a rip-rap apron that drains to a nearby wetland. The applicant should verify discharge from this roof, during extreme events, will not cause erosion and sedimentation into the wetland.

[BSC Group Response; January 24, 2024] This rip-rap apron has been sized to accommodate the peak flow associated with the 100-year storm from the outlet pipe for this portion of the roof runoff, such that there will be no erosion or scour. Please see Section 6.04 of the Stormwater Report for the rip-rap apron sizing calculations and Sheet C-202 for the detail of Flared End Section w/Stone Protection (Dissipation Bowl). For reference, the roof drain in question utilized flared end FES2.

[Hatch response; February 7, 2024] Based on conversation on February 6, 2024 facilitated by Chuck Tirone between the BSC Group and Hatch, the BSC group will verify that there is not erosion caused by runoff after it has discharged from the riprap apron.

2.3**Standard 2: Peak Rate Control and Flood Prevention**

Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for land subject to coastal storm flowage.

Hatch completed a review of the design relative to Standard 2; the following is a list of our findings and recommendations:

- Surficial fill soils were designated as a Hydrologic Soil Group C, and infiltration rates (0.52-inches/hour) were selected to be on the edge of published values for HSG C those soils, based varying composition of sandy loam, fine sandy loam and gravelly sandy loam.

[BSC Group Response; January 24, 2024] No response required.

- FEMA Technical Bulletin 6-93, Below-Grade Parking Requirements for Buildings Located in Special Flood Hazard Areas, clarified FEMA's policy that below grade parking is consistent with their definition of a basement, and that construction of the lowest floor (including basements) below the base flood elevation is prohibited for residential buildings. The FEMA base flood elevation "100-year" is 6.8-feet. As the building is proposed to be used for senior living residences and the proposed floodplain is adjacent to the structure, the proposed underground garage with elevation of 6.0-feet is below the base flood elevation (plus applicable freeboard and floodway surcharge requirements). Therefore, the proposed garage has a significant flood risk, as identified by FEMA.

[BSC Group Response; January 24, 2024] While the FEMA Technical Bulletin is not specifically applicable to a review under the Wetlands Protection Act and MassDEP's Stormwater Standards, it prohibits "the construction of below-grade parking garages...beneath residential buildings in Zones A1-A30, AE, and AH." Construction of the senior living building includes filling in the portions of the flood plain and, ultimately, altering its limits. The building will be constructed such that it is entirely outside the limits of the 6.8-foot base flood elevation (BFE). Therefore, construction of a garage beneath this building is allowed. A FEMA Elevation Certificate will be prepared for all buildings at the conclusion of construction demonstrating that all buildings are located above BFE. In addition, all below-grade areas in all buildings will be appropriately waterproofed to prevent groundwater intrusion.

[Hatch response; February 7, 2024] The scope of this review was for all facets of stormwater management. Our accepted proposal states that we will review the project based on industry best practices, Wetland Protection Act, and the Massachusetts Stormwater Handbook. Specifically, our accepted proposal also states that we will complete a review as to the Code of Federal Regulations in regards to the floodplain and that will review the FEMA Floodplain/floodway encroachments as well as CLOMR/LOMR/no-rise documents. Further, the Mass.gov webpage lists the Massachusetts Wetland Protection Act as one regulation and practice that is part of floodplain management. As the Town of Arlington participates in the National Flood Insurance Program, it therefore must abide by the applicable rules and regulations stemming from CFR 60.3.

Based on conversation on February 6, 2024 facilitated by Chuck Tirone between the BSC Group and Hatch, fill is being used to raise the existing structure and separate it from the FEMA floodplain .FEMA NFIP Technical Bulletin 10, published in March 2023, "Reasonably Safe from Flooding Requirement for Building on Filled Land" provides guidance on this topic. Our understanding is that the use of any type of fill to remove a building from the Special Flood Hazard Area (SFHA) requires the LOMR-F, instead of a FEMA Elevation Certificate. Further, our understanding is that FEMAAs requires the removal of the land from the SFHA before a basement, excavated into fill, is built below the base flood elevation using a LOMR-F process. It is our understanding that the FEMA then also requires a technical analysis showing the basement (garage) is reasonably safe from flooding and the Town of Arlington's designated local floodplain administrator to sign FEMA's Community Acknowledgement Form. The Town of Arlington's continued participation in the National Flood Insurance Program, with the significant benefit of subsidized flood insurance to its residents, requires it to comply with federal standards.

- The proposed basement elevations of the townhomes (elevation 3.0-feet) are 3.8-feet below the FEMA 100-year flood elevation of 6.8-feet. The proposed separation between these structures appears to be as little as 115-feet. A groundwater mounding analysis of the regional flood along Alewife Brook should be assessed to verify that groundwater intrusion from flooding along the watercourse does not impact the basements of the townhome structures. Note this is distinct from the completed groundwater mounding analysis of the infiltration basins.

[BSC Group Response; January 24, 2024] A mounding analysis of the regional flood along Alewife Brook is not a requirement under the Wetlands Protection Act and potential basement groundwater intrusion does not fall under the WPA jurisdiction. Additionally, as referenced in our response above, the proposed site work will result in all buildings being located outside the FEMA 100-year BFE and below-grade areas in all buildings will be appropriately waterproofed to prevent groundwater intrusion.

[Hatch response; February 7, 2024] This is a preference comment and can be considered closed.

- Proposed ACF R-Tank^{XD}s between the townhome units are nearly adjacent to the foundations of these structures with basements. The bottom of the chambers of these units are proposed to be at 6.0-feet (with bottom of stone at 5.67-feet), with the basement elevation of the adjacent townhomes at 3.0-feet. When these basins are filled with stormwater runoff, seepage will likely occur adjacent to the basement foundation wall, which will act as a preferential flow path (planar surface) with least resistance downward. Groundwater intrusion flood risk and seepage from these infiltration systems represents a concerning flood risk.

[BSC Group Response; January 24, 2024] See previous response to comments regarding waterproofing of buildings.

[Hatch response; February 7, 2024] No further action, the comment may be considered closed. Additional discussion on separation between groundwater elevation and basements is included in the subsequent bullet.

-
- Test Pit #1 (2023), located at the proposed ACF R-Tank^{XD} between the westernmost two townhome units, measured a point-in-time groundwater elevation of 1.5-feet, while the proposed basement elevations are at 3.0-feet. The Town of Arlington Zoning bylaws Section 5.8.6.A (2) state that for sites within an Inland Wetland District, at least 4.0-feet of separation should be provided between the floor of occupied levels and the seasonal high-water table.

[BSC Group Response; January 24, 2024] As mentioned in previous comments, the basements of the buildings will be waterproofed to prevent intrusion of groundwater. We also note that project was reviewed and permitted as to local regulations in effect at the date of submittal of the Comprehensive Permit application. This comment references a more recent version of the Zoning Bylaws, and further is not relevant to the stormwater review under the Wetlands Protection Act.

[Hatch response; February 7, 2024] Based on conversation on February 6, 2024 facilitated by Chuck Tirone between the BSC Group and Hatch, we understand that the Comprehensive Permit application was completed and the basement elevations approved prior to this stormwater peer review. The comment may be considered closed.

As a best practice, FEMA advises against construction of basements below the FEMA flood elevation (see Technical Bulletin #10 above) and established groundwater tables as these structures may be prone to damage by hydrostatic pressures and/or groundwater seepage. and note that construction.

A point of clarification, during the site visit, Hatch staff were informed that groundwater elevations were based on readings from “monitoring locations”. We now understand that the groundwater elevations are based on redox methods. As the margin for error is so close between the groundwater elevations and 1. The basement elevations and the seasonal high groundwater table and 2. The required separation between the infiltration feature bottoms and the seasonal high groundwater table, it is incumbent on the Hatch team to thoroughly review the established groundwater elevations as well as any discrepancies.

- Test Pits #2 and #4 pose similar challenges between the proposed basement elevation (3.0-feet) and insufficient separation to the groundwater table, located at 0.8 and 1.5-feet, respectively.

[BSC Group Response; January 24, 2024] See response to above comments.

[Hatch response; February 7, 2024] No further action, the comment may be considered closed. Additional discussion on separation between groundwater elevation and basements is included in the previous bullet.

- Test Pits #3 and #5 (2023) measured a point-in-time groundwater elevations (3.5 and 4.0-feet, respectively) above the proposed basement elevations of adjacent townhomes (3.0-feet).

[BSC Group Response; January 24, 2024] See response to above comments.

[Hatch response; February 7, 2024] No further action, the comment may be considered closed. Additional discussion on separation between groundwater elevation and basements is included in the bullet two above.

- Note that the seasonal high groundwater table may be higher than the 2023 point-in-time measurements and increase flood risk. Additionally, construction of a sump pump system, to mitigate flooding/groundwater intrusion, at any of these residences could lower the regional groundwater table.

[BSC Group Response; January 24, 2024] See response to above comments regarding waterproofing of basement areas. Use of or need for sump pumps has not yet been determined. Should sump pumps be proposed, they will be included in final plans and building permit plans submitted in accordance with the Comprehensive Permit for the Project.

[Hatch response; February 7, 2024] No further action. Comment may be considered closed.

2.4

Standard 3: Recharge to Ground Water

Loss of annual recharge to ground water shall be eliminated or minimized through the use of infiltration measures, including environmentally sensitive site design, low impact development techniques, best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Hatch reviewed the proposed infiltration systems for Standard 3: Recharge to Ground Water, below are our findings and recommendations:

- Test Pits #7 and #8 (2023) measured point-in-time groundwater elevations of 0.5 and 2.2, respectively. These test pits lie beneath the proposed Stormtrap infiltration system with a proposed bottom elevation of 6.0-feet. Massachusetts Stormwater guidelines state that at least two feet of separation shall be provided between the *seasonal high groundwater elevation* and the bottom of an infiltration structure. Based on our understanding from the site visit, the 2023 groundwater elevations were collected in May. We recommend collection of additional groundwater information, especially during the spring, to verify this standard is met.

[BSC Group Response; January 24, 2024] The highest estimated groundwater elevation on site was found to be 3.98 and was based on the highest observed redoxomorphic features in the soil, which were found in Test Pit #5. All infiltration systems on site were designed with a bottom elevation of 6.0 to provide a minimum of 2-feet of separation to this estimated seasonal high groundwater elevation (ESHGW). The test pits were conducted in Spring (May) of 2023 in coordination with the Town of Arlington Engineering and Conservation Departments and accepted practice under the Wetlands Protection Act, and consistent with the groundwater testing window set out within the Comprehensive Permit. It has been confirmed from USGS that streamflow conditions were within the normal range and that there were not drought conditions in this area at

that time. Test pit logs and groundwater elevations can be found in the Stormwater Report. Locations of test pits are shown on the Site Grading and Drainage Plan.

[Hatch response; February 7, 2024] The groundwater of the Stormtrap ST1 infiltration device should be reviewed. Based on simplified methods, Hatch expects approximately 2-3 feet of groundwater mounding beneath this basin for the design storms.

- Additional comments regarding groundwater connectivity, infiltration, and recharge can be found in the section of this review on Standard 2.

No response required.

2.5 Standard 4: 80% TSS Removal

Stormwater management systems must be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:

- *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan and thereafter are implemented and maintained.*
- *Stormwater BMPs are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
- *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

Hatch reviewed the proposed infiltration systems for Standard 4, below are our findings and recommendations:

- ♦ Point-in-time groundwater measurements were provided for review and incorporated into the design to provide at least 2-feet of separation between the bottom of the infiltration structure and the ground water table. The applicant should provide and review the *seasonal high groundwater elevation*, as is required by the Massachusetts Stormwater Handbook, to determine if adequate separation between the groundwater table and the structures is available.

[BSC Group Response; January 24, 2024] Please see above comments relating to the determination of the estimated seasonal high groundwater elevation and the elevations that were used for the infiltration systems. The Massachusetts Stormwater Handbook notes in Volume 3, Chapter 1 that "Depth to seasonal high groundwater may be identified based on redox features in the soil." Where redox features were found to be higher than the observed groundwater in the test pit, the elevation of the redox features was taken to be the estimated seasonal high groundwater elevation to ensure that suitable separation to infiltration practices was provided. Test pit logs and groundwater elevations can be found in the Stormwater Report.

[Hatch response; February 7, 2024] No further comment, this comment may be considered closed. Additional discussion regarding the type of groundwater measurements is included in Section 2 section.

- Near the existing wetlands, the lowest surveyed elevation shown in the drawings is 3.0-feet. The water surface elevation of the wetland should correlate to the groundwater elevations observed in the test pits. The measured groundwater table varies locally by as much as 4.5-feet between measurements, which is concerning for infiltration as a stormwater management strategy.

[BSC Group Response; January 24, 2024] While the measurements of the groundwater table varied in elevation across the site, the highest estimated seasonal groundwater elevation (3.98) was used for the conservative design of all of the infiltration systems. This ensures that 2-feet of separation to groundwater will be provided at a minimum across the site. This elevation corresponds well to elevations at the bordering vegetated wetlands (BVW) and observed conditions in the BVW.

[Hatch response; February 7, 2024] No further comment. The comment may be considered closed.

- Infiltration as a stormwater practice is challenging for many stormwater site designs near wetlands due to high groundwater tables. Therefore, establishing the seasonal high groundwater table is extremely important.

[BSC Group Response; January 24, 2024] As noted in previous comments, the estimated high seasonal groundwater elevations were determined in accordance with the Massachusetts Stormwater Handbook.

[Hatch response; February 7, 2024] No further comment. The comment may be considered closed.

- The water surface elevation and regulatory water levels of the wetland should be labeled on the plans and in the Stormwater report.

[BSC Group Response; January 24, 2024] This information is not required under the Wetlands Protection Act and does not provide any discernable value to determining groundwater elevations. In addition, the term "regulatory water levels of the wetland" are not defined or included in the Wetlands Protection Act, so it is not clear what would be noted on the plans. As noted in responses above, groundwater elevations were determined in accordance with the requirements of the Stormwater Handbook in the Spring of 2023, and the most conservative value found was utilized for all infiltration systems on site.

[Hatch response; February 7, 2024] No further comment. The comment may be considered closed.

2.6

Standard 5: Higher Potential Pollutant Loads (HPPL)

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention, all land uses with

higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific stormwater BMPs determined by the Department to be suitable for such use as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

We concur with the applicant's stormwater report that Standard 5 is not applicable to the project site as the site use is not consistent with a land use with higher potential pollutant load (LUHPPL).

[BSC Group Response; January 24, 2024] No response required.

2.7

Standard 6: Critical Areas

Stormwater discharges to a Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or any other critical area require the use of the specific source control and pollution prevention measures and the specific stormwater best management practices determined by the Department to be suitable for managing discharges to such area, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters or Special Resource Waters shall be set back from the receiving water and receive the highest and best practical method of treatment. A "stormwater discharge," as defined in 314 CMR 3.04(2)(a)1. or (b), to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of the public water supply.

The Massachusetts DEP has not identified the project site as a(n):

- Outstanding Resource Water,
- Public water supply (Zone Is, Zone IIs and Interim Wellhead Protection),
- Bathing beach,
- Cold-water fishery, or a
- Shellfish growing area.

We concur with the applicant's stormwater report that Standard 6 is not applicable to the project site.

[BSC Group Response; January 24, 2024] No response required.

2.8

Standard 7: Redevelopment Projects

A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the

maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

We concur with the applicant's stormwater report that Standard 7 is not applicable to the project site as the project is a new development.

[BSC Group Response; January 24, 2024] No response required.

2.9

Standard 8: Erosion, Sediment Control

A plan to control construction-related impacts, including erosion sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan), must be developed and implemented.

Hatch completed a review of the construction drawings, including applicable notes, SWPPP sheet, and Section 3 of the Stormwater Report in accordance with the *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas*. Based on our review, we recommend the following:

- Street cleaning, such as street sweeping or shoveling, should be included to periodically remove sediment that may have been tracked out of the project site, beyond the construction access. Street cleaning will be especially important following the saw cuts on Dorothy Road.

[BSC Group Response; January 24, 2024] The Construction Period Pollution Prevention Plan included in the Stormwater Report has been revised to include street cleaning at the end of each day as a requirement during construction.

[Hatch response; February 7, 2024] This comment is considered closed.

2.10

Standard 9: Operation and Maintenance Plan

A long-term operation and maintenance plan must be developed and implemented to ensure that stormwater management systems function as designed.

Hatch completed a review of the Operation and Maintenance Plan; based on our review, we recommend the following:

- Per Massachusetts Stormwater Standards, an estimate of the annual O&M budget shall be provided in Section 4.0 *Long-Term Pollution Prevention & Operation and Maintenance Plan* of the Stormwater Report.

[BSC Group Response; January 24, 2024] An estimated O&M budget has been added to the Long-Term Pollution Prevention and Operation and Maintenance Plan included in the Stormwater Report.

[Hatch response; February 7, 2024] This comment is considered closed.

- If using asphalt shingles on the townhomes, the loose grit be collected and disposed of, following construction, and prior to 6" roof drains being connected to infiltration basin.

[BSC Group Response; January 24, 2024] A note has been added to the Construction Period Pollution Prevention Plan included in the Stormwater Report (Section 3.7) that specifies that roof drains shall be connected to the infiltration basins after the area has

been cleaned to prevent loose material from the shingles from entering the drainage system.

[Hatch response; February 7, 2024] This comment is considered closed.

- Long term operation and maintenance for the on-site infiltration basins (both Stormtrap and R-Tank^{XD} systems) must be provided. The O&M plan should include the following provisions:
 - maintain an operation and maintenance log for the last three years, including inspections, repairs, replacement and disposal (for disposal, the log shall indicate the type of material and the disposal location).
 - make this log available to MassDEP and the Conservation Commission upon request; and
 - allow members and agents of the MassDEP and the Conservation Commission to enter and inspect the premises to evaluate and ensure that the responsibility party complies with the Operation and Maintenance Plan requirements for each BMP.
 - As the stormwater BMPs serve more than one lot, the applicant shall include with the Notice of Intent a mechanism for implementing and enforcing the Operation and Maintenance Plan. The applicant shall identify the lots or units that will be serviced by the proposed stormwater BMPs. The applicant shall also provide a copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of stormwater BMPs.

[BSC Group Response; January 24, 2024] The provisions noted above have been added to the Operation and Maintenance Plan included in the Stormwater Report. Please note that O&M provisions for the infiltration systems were already in the O&M Plan under "Underground Infiltration System". In addition, it should be clarified that all of the buildings in the Project (the 62+ building as well as the town homes) will be located on the same lot with ownership structure as condominiums. The responsible party for maintenance will be the condominium association. Upon establishment of the association, specific contact information can be provided.

[Hatch response; February 7, 2024] This comment is considered closed.

2.11 Standard 10: Illicit Discharges

All illicit discharges to the stormwater management system are prohibited.

The review has not identified any proposed illicit discharges. We concur with the applicant's stormwater report that Standard 10 is not applicable to the project site.

[BSC Group Response; January 24, 2024] No response required.

An unsigned Illicit Discharge Compliance Statement was provided in the Notice of Intent. The Illicit Discharge Compliance Statement should be signed prior to this issuance of permits.

[BSC Group Response; January 24, 2024] The Illicit Discharge Compliance Statement included in the NOI will be signed by the property owner prior to the issuance of an Order of Conditions.

[Hatch response; February 7, 2024] This comment is considered closed.

2.12 Miscellaneous Comments

The following is a list of stormwater review comments that do not fit within the Massachusetts Stormwater Standards and do not require response from the applicant.

- Arlington Land Realty address report on the title page of Thorndike Place Notice of Intent drawing package is inconsistent with the address for the same reported in the other reviewed submittal packages.

[BSC Group Response; January 24, 2024] Addresses provided on the Site Plans reference an old address for Arlington Land Realty while all other documents reference the current address. If required, a final set of Site Plans with the current address can be provided prior to issuance of an Order of Conditions.

N[Hatch response; February 7, 2024] o resubmittal to address this comment is required, comment is considered closed.



Ross Mullen

RM:RM

FEBRUARY 7, 2024

www.bscgroup.com

Town of Arlington Conservation Commission
c/o Mr. Ryan Clapp, Conservation Administrator
Robbins Memorial Town Hall
730 Massachusetts Avenue
Arlington, Massachusetts 02476

RE: Response to Peer Review Comments
SWCA Environmental Consultants, Restoration Plan Peer Review
Thorndike Place, Arlington, Massachusetts

Dear Members of the Arlington Conservation Commission,

On behalf of the Applicant, Arlington Land Realty, LLC, BSC Group, Inc. (BSC) is pleased to submit this response to peer review comments provided by SWCA Environmental Consultants (SWCA) relative to the Thorndike Place residential development (the Project) to be located off of Dorothy Road in the Town of Arlington. SWCA has performed a peer review of the Project's proposed restoration plan design on behalf of the Arlington Conservation Commission and issued comments in a memorandum dated January 23, 2024, titled *Notice of Intent Restoration Plan Peer Review, Thorndike Place, Arlington, Massachusetts*. For clarity, we have repeated the original comments from SWCA's peer review letter in standard text below utilizing the same numbering system and provided a summary of our response in *italics*.

SWCA Comment 1: Section 3.1.1, second paragraph. The narrative states that dead trees (i.e., snags) that do not provide wildlife habitat will be cut and stumped. Snags provide a wide variety of valuable wildlife habitat functions including shelter and forage opportunities. It is doubtful there are any snags that do not provide any wildlife habitat functions. Additionally, removal of snags does not appear to provide any ecological benefit and stumping of snags within the restoration area would likely result in unnecessary additional impacts (e.g., soil disturbance).

SWCA recommends that this language be revised to indicate that only snags that pose a hazard (e.g., leaning towards the proposed buildings and likely to result in property damage or injury) be removed and that no stumping will occur. SWCA recommends the Commission also consider a condition in the Order of Conditions (OOC), if issued, stating that any snags to be removed shall be approved by the Commission.

BSC Response 1: *BSC concurs with the recommended revision and suggests a Special Condition allowing removal of snags from the proposed restoration area that pose a hazard (e.g., leaning toward buildings and/or likely to result in property damage or personal injury) and that no stumping of removed snags shall be permitted. We additionally recommend that the Special Condition allow for a representative of the Commission be authorized to coordinate, review, and approve any snag removal on behalf of the Commission to avoid construction delays.*

SWCA Comment 2: Section 3.1.1, second paragraph. The narrative states that an Invasive Species Management Plan (ISMP) for work within resource areas and their buffer zones shall be developed as required by the Comprehensive Permit. During the site walk on January 5, representatives from BSC indicated that invasive species control would be included as part of the proposed restoration efforts. It is unclear how invasive species would be controlled (e.g., mechanical removal, chemical control, etc.) or what the target species would be.

SWCA recommends the Applicant develop a detailed ISMP to be included as part of the NOI that details what the target invasive species will be, proposed specific control methodologies, a monitoring plan to measure invasive vegetation control success, and performance goals. SWCA recommends the ISMP be reviewed by an expert in invasive species removal as some species (e.g., Japanese knotweed [*Reynoutria japonica*]) can be extremely challenging to effectively control.

BSC Response 2: *Several invasive plant species occur on the Site, most notably Japanese knotweed, Oriental Bittersweet, and Garlic Mustard. These occur within jurisdictional resource areas and buffer zones, as well as within non-jurisdictional areas of the site.*

BSC and the Applicant will prepare an Invasive Species Management Plan (ISMP) to treat invasive plants currently within the proposed wetland restoration area and to control their spread within the restoration area. BSC recommends that approval of such ISMP by the Conservation Commission's representative prior to the start of work be made a Special Condition of an Order of Conditions for the Project.

SWCA Comment 3: Section 3.1.1. The narrative includes multiple references to refuse that has been dumped on the site over the years. During the site walk on January 5, it was noted that as part of the proposed restoration work, the refuse would be removed as much as practicable.

SWCA recommends the Commission include a condition in the OOC, if issued, that requires all surficial refuse, including discarded clothing, metal, concrete rubble, lumber, plastic, and other similar garbage, to be removed from within the resource areas and their associated buffer zones within the limit of work. SWCA also recommends the Commission indicate that any refuse at the surface and partially buried be removed to a depth of up to 12 inches below ground (e.g., a shopping cart that has become partially buried in the soil).

BSC Response 3: *BSC concurs with SWCA Comment 3 and agrees such a Condition be included as part of the OOC.*

SWCA Comment 4: Section 3.1.1. The narrative provides a brief discussion of the proposed restoration activities, specifically restoration plantings. However, successful habitat restorations consider a wide variety of considerations, beyond vegetation. More specifically, the wildlife habitat and vegetation evaluation provided in Attachment G of the NOI identifies numerous wildlife habitat features including large woody debris, snags, hard mast and berry producing forage, rocks and rock piles, and others.

SWCA recommends the restoration plan consider how to improve important wildlife habitat functions within the restoration area and include methods to provide important wildlife habitat features that may be lost due to proposed impacts elsewhere on site.

BSC Response 4: *The Restoration Plan has been updated to include proposed placement of coarse woody debris and stones and a few stone piles using natural materials originating from within the Limit of Work on the Project site. The Restoration Plan maximizes the use of native berry and mast producing vegetation to benefit wildlife habitat values of the restoration area. See Appendix for details of wildlife habitat features.*

SWCA Comment 5: Section 3.1.1. The narrative and the wildlife habitat and vegetation evaluation identify numerous native and non-native trees and shrubs within the project limit of work, including the restoration area. However, out of the 17 proposed trees and shrubs to be planted, only two (red maple [*Acer rubrum*] and American hornbeam [*Carpinus caroliniana*]) are included on the plant schedule.

SWCA recommends the restoration plan be revised to include species within the restoration area that occur on-site to better represent the diversity and community structure of adjacent habitats. There are numerous trees and shrubs documented in the NOI application materials that would be suitable for the restoration area including American elm (*Ulmus americana*), black cherry (*Prunus serotina*), yellow birch (*Betula allegheniensis*), sweet birch (*Betula lenta*), box elder (*Acer negundo*), silver maple (*Acer saccharinum*), white pine (*Pinus strobus*), sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), and others that are also typically readily available as nursery stock.

BSC Response 5: BSC concurs with SWCA Comment 5 and has updated the proposed planting plan and shown approximate locations of wildlife habitats.

SWCA Comment 6: Sheet G-101, Planting Notes, Note 11. The site plans indicate that the plant species indicated on the plant list are recommendations only and that final selection of the species shall occur at the time of plant purchase, depending on availability and that the size and quantity shall not change without approval of the Applicant's landscape architect.

SWCA recommends this note be revised to indicate that the proposed planting species, sizes, and quantities may be subject to change based on availability. However, these changes should be approved by the Conservation Commission and should be approved prior to purchase.

BSC Response 6: BSC has made the recommended revision to the Sheet G-101 Planting Notes, Note 11. We recommend that the Order of Conditions allow administrative approval of such availability-based changes by the Conservation Commission or its authorized representative to prevent undue construction delays in making such substitutions if necessary.

SWCA Comment 7: Sheet G-101, Comprehensive Permit Notes, Comment I.5. This comment notes that dumping of woody vegetation, brush, and other debris in a resource area or its associated buffer zone is prohibited.

SWCA notes that an exception to this requirement might be considered for the restoration area as large woody debris, brush piles, and other similar wildlife habitat features provide quality habitat functions and are likely to increase the ecological value of the restored habitats.

BSC Response 7: Sheet G-101, Comprehensive Permit Notes, Comment 1.5 is a Condition of the Comprehensive Permit, and the wording is copied directly from that Condition. The intent of the Condition is to prohibit the dumping of materials removed during construction in the wetlands or buffer zone. In accordance with BSC Response 4 above, the Restoration Plan will be updated with detailed natural coarse woody debris and stone wildlife habitat features using materials originating from the site, but material removed from the site during construction will not be disposed of within resource areas or associated buffer zones in accordance with the Comprehensive Permit condition.

SWCA Comment 8: Sheet G-101, Comprehensive Permit Notes, Comment I.25. The site plans note that the survival rate of planted species shall be 80% at the end of the third year and that a corrective action plan must be submitted if the survival rate is less than 80% at the end of the third year.

SWCA recommends the Commission consider requiring a corrective action plan to be developed by the Applicant if the 80% success rate is not met after any year of monitoring. Waiting until the third year of monitoring to develop and implement any corrective actions may unnecessarily prolong reaching the project's performance goals and may result in unnecessary disturbance to the area to rectify any adverse conditions since the restoration area will have had three years to establish.

BSC Response 8: Sheet G-101, Comprehensive Permit Notes, Comment I.25 is a condition of the Comprehensive Permit, and the wording is copied directly from that Condition. The Comprehensive Permit Condition was prepared upon the recommended conditions submitted to the Zoning Board by the Conservation Commission by letter dated October 14, 2021.

SWCA Comment 9: Sheet L-100, Plant Schedule. The plant schedule includes a number of proposed cultivars within the 100-foot Buffer Zone (e.g., *Clethra alnifolia* 'ruby spice', *Hydrangea quercifolia* 'ruby slippers', and *Hydrangea arborescens* 'annabelle'). In accordance with condition I.24 of the Comprehensive Permit, all mitigation plantings and plantings within all resource areas shall be native, non-cultivar species. Additionally, other cultivars are proposed in other areas of the site along side non cultivars of native species (e.g., pin oak [*Quercus palustris*] and green pillar pin oak [*Q. palustris* 'pringreen']).

SWCA recommends the planting plan be revised to not include any cultivars.

BSC Response 9: BSC concurs with SWCA Comment 9 and has revised the planting plan to not include cultivars within the 100-foot buffer.

SWCA Comment 10: Sheet L-100. A note on the plans indicates that all dead trees (i.e., snags) that do not provide wildlife habitat per the landscape architect and wildlife ecologist should be removed. Snags provide a wide variety of valuable habitat functions for wildlife including forage for insects, perches to hunt from, shelter if there are cavities or cracks, and other functions.

SWCA recommends this note be revised to indicate that only snags that pose a hazard (e.g., may fall and land on the buildings) may be removed and that removal of any snags must be approved by the Commission.

BSC Response 10: BSC concurs with SWCA Comment 10 and has revised Sheet L-100 according to SWCA's Comments 1 and 10.

We look forward to discussing this project with you further at the upcoming public hearings on the project. Please feel free to contact me at (617) 896-4386 or drinaldi@bscgroup.com should you have any questions on the information in this report.

Sincerely,
BSC GROUP, INC.



Dominic Rinaldi, PE
Senior Associate

Attachments: Revised General Notes and Legend

Revised Planting Plan
Habitat Details

GENERAL NOTES

- EXISTING CONDITIONS SURVEY INFORMATION WAS PREPARED BY BSC GROUP, INC. SURVEY IS BASED ON AN ON-THE-GROUND SURVEY CONDUCTED BY BSC GROUP IN DECEMBER 2019-FEBRUARY 2020.
- REVIEW ALL EXISTING CONDITIONS IN THE FIELD AND REPORT ANY DISCREPANCIES BETWEEN PLANS AND ACTUAL CONDITIONS TO THE OWNER'S REPRESENTATIVE IN WRITING PRIOR TO STARTING WORK.
- THE LOCATIONS OF UNDERGROUND UTILITIES SHOWN ON THIS PLAN ARE BASED ON THE SURVEY REFERENCED ABOVE. THE CONTRACTOR SHALL CONTACT DIGSAFE (888-344-7233 OR 811) AND THE PROPER LOCAL AUTHORITIES OR RESPECTIVE UTILITY COMPANIES TO CONFIRM THE LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. ANY DAMAGE DUE TO FAILURE OF THE CONTRACTOR TO CONTACT THE PROPER AUTHORITIES SHALL BE BORNE BY THE CONTRACTOR.
- ANY DISCREPANCIES BETWEEN DRAWINGS, SPECIFICATIONS, AND SITE CONDITIONS SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER IN WRITING FOR CLARIFICATION AND RESOLUTION PRIOR TO BIDDING OR CONSTRUCTION.

SITE PREPARATION NOTES

- ONLY AREAS DESIGNATED FOR CLEARING SHALL BE CLEARED.
- THE SUBCONTRACTOR(S) IS/ARE RESPONSIBLE FOR ANY DAMAGE TO EXISTING CONDITIONS TO REMAIN THAT ARE DUE TO SUBCONTRACTOR(S) OPERATIONS.
- ITEMS TO BE REMOVED THAT ARE NOT STOCKPILED FOR LATER REUSE ON THE PROJECT OR DELIVERED TO THE OWNER SHALL BE LEGALLY DISPOSED OF OFF SITE BY THE SUBCONTRACTOR(S).
- THE SUBCONTRACTOR(S) SHALL BE RESPONSIBLE FOR COORDINATING THEIR EFFORTS WITH ALL TRADES.
- THE CONTRACTOR SHALL COORDINATE ALL ADJUSTMENT OR ABANDONMENT OF UTILITIES WITH THE RESPECTIVE UTILITY COMPANY.
- THE SUBCONTRACTOR(S) SHALL MAINTAIN OR ADJUST TO NEW FINISH GRADE AS NECESSARY ALL UTILITY AND SITE STRUCTURES SUCH AS LIGHT POLES, SIGN POLES, MAN HOLES, CATCH BASINS, HOLE HOLE, WATER AND GAS GATES, HYDRANTS, ETC., FROM MAINTAINED UTILITY AND SITE SYSTEMS UNLESS OTHERWISE NOTED OR DIRECTED BY THE CONTRACTOR/ENGINEER.
- TEMPORARY CONSTRUCTION HAUL ROADS (IF REQUIRED) SHALL BE EXCAVATED AND THE SUB-BASE COMPAKTED TO 95% SPMD. THE USE OF SEPARATION FABRICS MAY BE USED TO FACILITATE FUTURE REMOVAL AND RECOVERY OF GRANULAR MATERIALS. HAUL ROAD SHALL HAVE AT LEAST 9" OF 6-INCH MINUS STONE AND SHALL BE MAINTAINED DURING CONSTRUCTION.

EROSION AND SEDIMENT CONTROL MEASURES

- EROSION CONTROL SHALL BE PROVIDED IN ACCORDANCE WITH THE SEQUENCE OF STAGED CONSTRUCTION. THE CONTRACTOR SHALL SUBMIT A DETAILED EROSION CONTROL PLAN INCLUDING SCHEDULE FOR APPROVAL BY THE TOWN OF ARLINGTON. A COPY OF THE APPROVED NPDES - EROSION AND SEDIMENT CONTROL PLAN SHALL BE MAINTAINED ON THE SITE.
- ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO ANY SITE EXCAVATION OR DISTURBANCE AND SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PROCESS. THE SMALLEST PRACTICAL AREA OF LAND SHALL BE EXPOSED AT ANY ONE TIME.
- SEDIMENT TRAPS SHALL BE INSTALLED AT DRAINAGE STRUCTURES IN PUBLIC STREET IN THE PROJECT AREA. STRAW BALES BARRIERS AND SILTATION FENCES ARE TO BE MAINTAINED AND CLEANED UNTIL ALL SLOPES HAVE BEEN STABILIZED.
- SEDIMENT BARRIERS SHALL BE INSPECTED AND APPROVED BY THE TOWN OF ARLINGTON BEFORE CONSTRUCTION CAN START.
- STRAW BALES AND MULCH SHALL BE MOWINGS OF ACCEPTABLE HERBACEOUS GROWTH, FREE OF NOXIOUS WEEDS OR WOODY STEMS, AND SHALL BE DRY WHEN INSTALLED.
- THE UNDERSIDE OF STRAW BALES SHOULD BE KEPT IN CLOSE CONTACT (TRENCHED IN 3-INCHES MINIMUM) WITH THE EARTH AND RESET AS NECESSARY.
- DISTURBED AREAS SHALL BE BLANKETED OR SEEDED AND MULCHED AS SOON AS PRACTICAL AFTER CONSTRUCTION ACTIVITIES IN THAT AREA HAVE CONCLUDED. ALL ERODABLE/BARE AREAS SHALL BE BLANKETED OR SEEDED AND MULCHED WITHIN 7 DAYS WITH TEMPORARY EROSION CONTROL SEEDING.
- STABILIZE SLOPES GREATER THAN 3:1 (HORIZONTAL:VERTICAL) WITH SEED, SECURED GEOTEXTILE FABRIC, SPRAYED COMPOST BLANKET, OR RIP-RAP AS REQUIRED TO PREVENT EROSION DURING CONSTRUCTION.
- SEDIMENT BARRIERS SHALL BE CONSTRUCTED AROUND ALL SOIL STOCKPILE AREAS.
- CLEAN OUT DRAINAGE FEATURES AND STRUCTURES AFTER COMPLETION OF CONSTRUCTION.
- SEDIMENT COLLECTED DURING CONSTRUCTION BY THE VARIOUS TEMPORARY EROSION CONTROL SYSTEMS SHALL BE DISPOSED OF OFF SITE ON A REGULAR BASIS. SEDIMENT SHALL BE REMOVED FROM EROSION CONTROL SYSTEMS WHEN THE HEIGHT OF THE SEDIMENT EXCEEDS ONE-HALF OF THE HEIGHT OF THE SEDIMENT CONTROL MEASURE.
- AFTER ALL DISTURBED AREAS HAVE BEEN STABILIZED, THE SUBCONTRACTOR(S) SHALL REMOVE ALL TEMPORARY EROSION CONTROL MEASURES AT THE CONTRACTOR/ENGINEER DIRECTION.
- AFTER THE REMOVAL OF TEMPORARY EROSION CONTROL MEASURES, THE SUBCONTRACTOR(S) SHALL GRADE AND SEED AREA OF TEMPORARY EROSION CONTROL MEASURE.
- DAMAGED OR DETERIORATED ITEMS WILL BE REPAIRED IMMEDIATELY AFTER IDENTIFICATION OR AS DIRECTED BY THE CONTRACTOR/ENGINEER.
- THE CONTRACTOR'S SITE SUPERINTENDENT WILL BE RESPONSIBLE FOR DAILY INSPECTIONS, MAINTENANCE, AND REPAIR ACTIVITIES. THE CONTRACTOR SHALL INSPECT EROSION CONTROL MEASURES EVERY SEVEN (7) CALENDAR DAYS. DAMAGED AND INEFFECTIVE EROSION CONTROL MEASURES SHALL BE REPAIRED OR REPLACED WITHIN 48 HOURS.
- PIPE OUTLETS (IF ANY) SHALL BE STABILIZED WITH STONE.
- TEMPORARY SEEDING SHALL BE AT A RATE OF 45 LBS PER ACRE. ERODABLE AREAS OUTSIDE AND DOWN SLOPE FROM THE CONSTRUCTION LIMITS SHALL BE SIMILARLY SEDED.
- WATER PUMPED OR OTHERWISE DISCHARGED FROM THE SITE DURING CONSTRUCTION Dewatering SHALL BE FILTERED. Dewatering PLAN SHALL BE SUBMITTED FOR APPROVAL BY THE ENGINEER.
- WHEN TEMPORARY DRAINAGE IS ESTABLISHED, EROSION/SEDIMENTATION CONTROL MEASURES MAY BE REQUIRED BY CONTRACTOR/ENGINEER.
- GRAVEL CONSTRUCTION ROADS AND CONSTRUCTION PARKING AREAS OF SUFFICIENT WIDTH AND LENGTH, AND VEHICLE WASH DOWN FACILITIES, SHALL BE PROVIDED TO PREVENT SOIL FROM BEING TRACKED INTO PUBLIC OR PRIVATE ROADWAYS. ANY SOIL REACHING A PUBLIC OR PRIVATE ROADWAY SHALL BE REMOVED BEFORE THE END OF EACH WORKDAY AND AS NEEDED.
- NECESSARY MEASURES SHALL BE TAKEN TO CONTAIN ANY FUEL OR POLLUTION RUNOFF. LEAKING EQUIPMENT OR SUPPLIES SHALL BE IMMEDIATELY REPAIRED OR REMOVED FROM THE SITE.
- THE COST OF REPAIRING OR REMOVING SEDIMENT FROM EROSION CONTROL SYSTEMS SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE FOR THE APPLICABLE EROSION CONTROL ITEM.
- ALL EROSION CONTROL MEASURES SHALL BE KEPT OPERATIONAL AND MAINTAINED CONTINUOUSLY THROUGHOUT THE PERIOD OF LAND DISTURBANCE UNTIL PERMANENT SEDIMENT AND EROSION CONTROL MEASURES ARE OPERATIONAL. CONTRACTOR SHALL PROVIDE TO THE CONSERVATION COMMISSION MEASURES (EROSION AND SEDIMENTATION CONTROL) FOR WORK DURING WINTER CONDITIONS.
- CONTRACTOR SHALL SPRAY WATER FROM A WATER TRUCK ON DRY AND WINDY DAYS TO PREVENT DUST FROM FORMING.
- EROSION CONTROL MEASURES AS SHOWN ON THESE DRAWINGS ARE INTENDED TO CONVEY MINIMUM REQUIREMENTS. THE CONTRACTOR SHALL IMPLEMENT ADDITIONAL MEASURES AS NECESSARY TO PREVENT SOIL EROSION AND TO COMPLY WITH THE PROJECT'S STORMWATER POLLUTION PREVENTION PLAN.
- SOILS ON SLOPES THAT ARE 3:1 OR STEEPER SHOULD BE ROUGHENED PER THE EPA'S NPDES SOIL ROUGHENING FACT SHEET IF THEY ARE TO BE SEDED WITHIN 2 WEEKS OF DISTURBANCE. IF NOT, EROSION CONTROL BLANKETS SHOULD BE INSTALLED ON THESE SLOPES.

LAYOUT AND MATERIAL NOTES

- THE FOLLOWING LAYOUT CRITERIA SHALL CONTROL UNLESS OTHERWISE NOTED ON THE PLAN:
 - ALL TIES TO PROPERTY LINES ARE PERPENDICULAR TO THE PROPERTY LINE UNLESS OTHERWISE NOTED.
 - DISTANCES AND DIMENSIONS ARE IN DECIMAL FEET.
- SCREENED IMAGES SHOW EXISTING CONDITIONS. WHERE EXISTING CONDITIONS LIE UNDER OR ARE IMPIED UPON BY PROPOSED BUILDINGS AND/OR SITE ELEMENTS, THE EXISTING CONDITION SHALL BE REMOVED, ABANDONED AND/OR CAPPED OR DEMOLISHED AS REQUIRED. AMBIGUITIES IN THE PLANS SHALL BE CLARIFIED BY THE ENGINEER OR SITE SUPERINTENDENT UPON WRITTEN REQUEST FOR CLARIFICATION BY THE SUBCONTRACTOR.

GRADING AND UTILITY NOTES

- THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE APPLICANT. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MAY BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ALL UNDERGROUND UTILITIES.
- THE PROJECT APPLICANT SHALL OBTAIN ALL NECESSARY STREET-OPENING PERMITS, WATER AND SEWER CONNECTION PERMITS AND PAY REQUIRED FEES PRIOR TO COMMENCING WORK ON THESE UTILITIES.
- WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION, AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY COORDINATION WITH THE TOWN OF ARLINGTON.
- ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF ALL GAS, ELECTRIC, TELEPHONE, AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES SHALL BE MADE BY THE PROJECT APPLICANT.
- AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONSTRUCTION SHALL BE RESTORED TO THEIR ORIGINAL CONDITION.
- WHERE PROPOSED GRADES MEET EXISTING GRADES, SUBCONTRACTOR(S) SHALL BLEND GRADES TO PROVIDE A SMOOTH TRANSITION BETWEEN EXISTING AND NEW WORK. PONDING AT TRANSITION AREAS WILL NOT BE ALLOWED.
- POSITIVE DRAINAGE SHALL BE MAINTAINED AWAY FROM ALL STRUCTURES.
- SUBCONTRACTOR(S) SHALL VERIFY EXISTING GRADES AND NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES.
- PRIOR TO ANY WORK OVER EXISTING TOWN-OWNED UTILITIES, CONTRACTOR TO EVALUATE CONDITION OF SUBSURFACE UTILITIES PRIOR TO CONSTRUCTION. A POST-CONSTRUCTION EVALUATION SHALL ALSO BE PERFORMED TO IDENTIFY ANY DAMAGE CAUSED DURING CONSTRUCTION.
- ANY INSTALLATION OF UTILITY POLES OR UNDERGROUND CONDUIT WITHIN THE PUBLIC RIGHT-OF-WAY WILL REQUIRE A GRANT OF LOCATION FROM THE BOARD OF SELECTMEN.

PLANTING NOTES

- MAINTENANCE SHALL BEGIN IMMEDIATELY AFTER PLANTING AND SHALL CONTINUE UNTIL FINAL WRITTEN ACCEPTANCE OF PLANT MATERIAL.
- MAINTAIN POSITIVE DRAINAGE AWAY FROM ALL BUILDING FOUNDATIONS AND STRUCTURES.
- MAXIMUM SLOPE WITHIN DISTURBED AREAS SHALL NOT EXCEED 3:1, UNLESS OTHERWISE NOTED.
- THE LANDSCAPE CONTRACTOR SHALL SUPPLY ALL PLANT MATERIALS IN QUANTITIES SUFFICIENT TO COMPLETE PLANTINGS SHOWN ON THE DRAWINGS.
- MATERIALS SHALL CONFORM TO THE GUIDELINES ESTABLISHED BY THE AMERICAN NURSERY AND LANDSCAPE ASSOCIATION.
- PLANTS SHALL BEAR THE SAME RELATIONSHIP TO FINISH GRADE AS TO ORIGINAL GRADES BEFORE DIGGING.
- PLANTS SHALL BE BALLED IN BURLAP OR CONTAINERIZED.
- AREAS PLANTED WITH EVERGREEN TREES SHALL BE COVERED WITH A MINIMUM 3" OF MULCH. MULCH FOR PLANTED AREAS TO BE AGED PINE BARK: PARTIALLY DECOMPOSED, DARK BROWN IN COLOR AND FREE OF WOOD CHIPS THICKER THAN 1/4 INCH.
- THE LANDSCAPE CONTRACTOR SHALL GUARANTEE ALL PLANT MATERIALS FOR ONE (1) FULL YEAR FROM DATE OF ACCEPTANCE.
- PLANT MATERIALS ARE SUBJECT TO THE APPROVAL OF THE LANDSCAPE ARCHITECT, AT THE NURSERY, AND AT THE SITE.
- PLANT SPECIES AS INDICATED IN THE PLANT LIST ARE SUGGESTIONS ONLY. FINAL SELECTION OF SPECIES SHALL OCCUR AT THE TIME OF PLANT PURCHASE, DEPENDING ON AVAILABILITY. PLANT SIZE AND QUANTITY SHALL NOT CHANGE WITHOUT APPROVAL OF LANDSCAPE ARCHITECT. ANY CHANGES TO PLANT SPECIES SHALL BE REVIEWED AND APPROVED BY A REPRESENTATIVE OF THE ARLINGTON CONSERVATION COMMISSION PRIOR TO PURCHASE.

COMPREHENSIVE PERMIT NOTES

- CONTRACTOR REQUIRED TO ABIDE BY THE 'DECISION ON APPLICATION FOR COMPREHENSIVE PERMIT' ISSUED ON NOVEMBER 22, 2021 WITH SPECIFIC ATTENTION BROUGHT TO THE FOLLOWING CONDITIONS.
- D.15 BURNING OR BURIAL OF CONSTRUCTION OR DEMOLITION DEBRIS ON THE SITE IS STRICTLY PROHIBITED. ALL SUCH MATERIALS ARE TO BE REMOVED FROM THE SITE IN ACCORDANCE WITH APPLICABLE LAW. DURING CONSTRUCTION, THE SITE SHALL BE SECURED AGAINST UNAUTHORIZED ENTRY OR VANDALISM BY FENCING, OR OTHER APPROPRIATE MEANS, AND ALL CONSTRUCTION MATERIALS SHALL BE STORED OR STOCKPILED ON SITE, IN A SAFE MANNER. ANY FLOODLIGHTS USED DURING THE CONSTRUCTION PERIOD SHALL BE LOCATED AND DIRECTED SO AS TO PREVENT SPILLOVER OR ILLUMINATION ONTO ADJACENT PROPERTIES. ALL CONSTRUCTION ACTIVITIES ARE TO BE CONDUCTED IN A WORKMANLIKE MANNER.
- D.16 NO BUILDING AREAS SHALL BE LEFT IN AN OPEN, UNSTABILIZED CONDITION LONGER THAN SIXTY (60) DAYS. TEMPORARY STABILIZATION SHALL BE ACCOMPLISHED BY HAY BALES, HAY COVERINGS OR MATTING. FINAL STABILIZATION SHALL BE ACCOMPLISHED BY LOAMING AND SEEDING EXPOSED AREAS.
- D.17 ALL DUMPSTERS SERVING THE PROJECT SHALL BE ENCLOSED AND COVERED (WITH THE EXCEPTION OF CONSTRUCTION DUMPSTERS USED DURING CONSTRUCTION). THE BOARD SHALL REVIEW THE DUMPSTER LOCATION AS PART OF THE APPROVAL OF THE FINAL PLANS IF DIFFERENT FROM WHAT HAS BEEN SHOWN ON THE APPROVED PLANS.
- H.2 ALL WATER AND SEWER INFRASTRUCTURE SHALL BE INSTALLED IN CONFORMANCE WITH THE ARLINGTON WATER AND SEWER DIVISION'S TECHNICAL REQUIREMENTS. THE APPLICANT SHALL PROVIDE THE ARLINGTON WATER AND SEWER DIVISION WITH CALCULATIONS TO ENSURE THE DISTRIBUTION SYSTEM FOR THE AREA HAS THE NECESSARY CAPACITY TO MEET SYSTEM DEMAND REQUIRED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
- I.1 PRIOR TO COMMENCEMENT OF SITE CLEARING, PREPARATION, AND CONSTRUCTION, EROSION CONTROL MEASURE SHALL BE INSTALLED CONSISTENT WITH THE APPROVED PLANS.
- I.3 NO UNCOVERED STOCKPILING OF EARTHEN AND/OR CONSTRUCTION-RELATED MATERIALS SHALL BE PERMITTED WITHIN THE ONE HUNDRED FOOT (100') WETLAND BUFFER ZONE (ALSO REFERENCED AS ADJACENT UPLAND RESOURCES AREA ("AURA")) OR OTHER RESOURCE AREAS.
- I.4 NO HEAVY EQUIPMENT MAY BE STORED OVERNIGHT WITHIN THE FIFTY FEET (50') OF BORDERING OR ISOLATED VEGETATED WETLAND RESOURCE AREAS, AND NO REFUELING OR MAINTENANCE OF MACHINERY OR VEHICLES SHALL BE ALLOWED WITHIN THE ONE HUNDRED FOOT (100') BUFFER ZONE, AURA, OR WITHIN ANY BORDERING OR ISOLATED VEGETATED WETLAND RESOURCE AREA OR BORDERING LAND SUBJECT TO FLOODING (BLFS).
- I.5 THERE SHALL BE NO DUMPING OF WOODY VEGETATION, LEAVES, GRASS CLIPPINGS, BRUSH, OR OTHER DEBRIS INTO A WETLAND RESOURCE AREA OR ASSOCIATED BUFFER ZONES. DUMPING OF SNOW INTO A WETLAND RESOURCE AREA IS ALSO PROHIBITED AND SHALL COMPLY WITH THE CURRENT MASS DEP BUREAU OF WATER RESOURCES SNOW REMOVAL GUIDANCE. THE FOREGOING DOES NOT APPLY TO THE CLEAN SNOW REMOVED FROM THE EMERGENCY ACCESS ROAD AS LONG AS NO SAND OR NON-APPROVED DE-ICING MATERIALS ARE USED, AND THE SNOW IS CLEAR OF ALL FOREIGN DEBRIS. AN ALTERNATIVE DE-ICING PRODUCT SUCH AS MAGNESIUM CHLORIDE (MgCl) MAY BE USED AS RECOMMENDED IN THE WINTER PARKING LOT AND SIDEWALK MAINTENANCE MANUAL PUBLISHED BY THE MINNESOTA POLLUTION CONTROL AGENCY, [HTTP://WWW.POLLUTIONCONTROL.MN.GOV/DEFUALT/FILE/07-TRM-10.PDF](http://WWW.POLLUTIONCONTROL.MN.GOV/DEFUALT/FILE/07-TRM-10.PDF)

1.6 THE APPLICANT SHALL HIRE A QUALIFIED ENVIRONMENTAL MONITOR WHO WILL REPORT TO THE BOARD AND WILL BE ON-SITE AS PROJECT CONSTRUCTION ADVANCES. THE ENVIRONMENTAL MONITOR SHALL SUBMIT AN ELECTRONIC REPORT TO THE BOARD WEEKLY DURING SITE PREPARATION WORK WITHIN THE ONE HUNDRED FOOT (100') BUFFER ZONE TO VEGETATED WETLANDS, INCLUDING AN UPDATE ON THE FUNCTIONALITY AND CONDITION OF THE EROSION CONTROL MEASURES, UNTIL SUCH TIME THAT THE SITE IS STABILIZED. THE APPLICANT SHALL PROVIDE THE BOARD WITH THE NAME(S), ADDRESS(ES) AND TELEPHONE NUMBER(S) OF THE ENVIRONMENTAL MONITOR PRIOR TO THE START OF WORK.

1.7 WHILE ACTIVE CONSTRUCTION WORK IS UNDERWAY WITHIN THE ONE HUNDRED FOOT (100') BUFFER ZONE, AND DURING THE CREATION OF THE FLOODPLAIN COMPENSATION AREA, INCLUDING REMOVAL OF VEGETATION INCLUDING INVASIVE SPECIES, FINAL GRADE ESTABLISHMENT, CREATION OF SOIL PROFILE TO SUPPORT PROPOSED PLANT SPECIES, AND RESTORATION OF A DIVERSIFIED PLANT COMMUNITY, THE ENVIRONMENTAL MONITOR SHALL PROVIDE MONTHLY STATUS REPORTS TO THE BOARD TO CONFIRM THAT ALL ACTIVITIES ARE SUBSTANTIALLY IN COMPLIANCE WITH THE COMPREHENSIVE PERMIT AND ORDER OF CONDITIONS ISSUED BY THE ARLINGTON CONSERVATION COMMISSION. THE ZBA MAY REDUCE THE FREQUENCY OF INSPECTIONS OR REPORTS AS DEEMED APPROPRIATE. THE QUALIFIED ENVIRONMENTAL MONITOR SHALL ALSO SUBMIT AN ELECTRONIC REPORT WITHIN SEVEN DAYS AFTER EVERY RAIN EVENT EXCEEDING 0.5 INCHES OF RAIN IN A 24-HOUR PERIOD TO THE BOARD REGARDING THE CONDITION OF THE PROPERTY DURING AND AFTER THE RAIN EVENT. SUCH REPORT SHALL ALSO INCLUDE THE STATUS OF EROSION CONTROL MEASURES AND ANY ADDITIONAL MEASURES TO ADDRESS STORMWATER MANAGEMENT CAUSED BY SAID RAIN EVENT. THE QUALIFIED ENVIRONMENTAL MONITOR WILL ALSO REVIEW THE APPLICANT'S SWPPP INSPECTION REPORT, AS APPROPRIATE AND NECESSARY.

1.8 ALL WORK SHALL BE CONDUCTED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN. WITHIN ONE WEEK OF FINAL GRADING, WATER PERMITTING, ALL DISTURBED AREAS LOCATED WITHIN THE WETLAND RESOURCE AREAS AND BUFFER ZONES SHALL BE STABILIZED AGAINST EROSION. THIS SHALL BE DONE EITHER BY SODDING OR BY LOAMING, SEEDING AND MULCHING ACCORDING TO SOIL CONSERVATION SERVICE STANDARDS AND THE APPROVED PLANS. STABILIZATION WILL BE COMPLETED WHEN THE SURFACE SHOWS COMPLETE VEGETATIVE COVER. TEMPORARY STABILIZATION MEASURES APPROVED BY THE BOARD'S INSPECTOR ENGINEER WILL BE REQUIRED SHOULD WORK BE INTERRUPTED FOR MORE THAN TEN (10) DAYS.

1.9 THE APPLICANT, SUCCESSOR OR ASSIGNS SHALL ENSURE THE CLEANLINESS OF ALL CATCH BASINS AND ROADWAY AFFECTED BY THE PROJECT RELATED ACTIVITY. ALL CATCH BASINS WILL BE PROTECTED BY A "SILT BAG INLET PROTECTION" DEVICE OR EQUAL DURING THE PROJECT WORK PERIOD. THE APPLICANT SHALL INSPECT AND CLEAN AS NECESSARY, ALL CATCH BASINS AND SWEEP THE ROADWAY AT LEAST WEEKLY DURING CONSTRUCTION. IT MAY BE REQUIRED MORE FREQUENTLY DURING AND AFTER RAIN EVENTS. IF IT IS DEEMED NECESSARY TO REMOVE THE SILT BAG INLET PROTECTION TO PREVENT LOCALIZED FLOODING AND PUBLIC SAFETY CONCERN, THE APPLICANT SHALL NOTIFY THE BOARD AND ARLINGTON DPW AND ALSO THE QUALIFIED ENVIRONMENTAL MONITOR.

1.11 THE BOARD OR ITS DULY APPOINTED AGENT (WHICH MAY BE THE TOWN CONSERVATION AGENT ACTING ON BEHALF OF THE BOARD) SHALL HAVE THE RIGHT TO ENTER THE PROPERTY FOR INSPECTIONS AND EVALUATE COMPLIANCE WITH THE WETLANDS CONDITIONS CONTAINED HEREIN UPON REASONABLE NOTICE OF NOT LESS THAN TWENTY-FOUR (24) HOURS. ACCESS SHALL BE ALLOWED WITHOUT THE NEED FOR ADVISED NOTICE IN EMERGENCY SITUATIONS WHEN NECESSARY TO PREVENT IMMINENT HARM TO WETLANDS RESOURCE AREAS.

1.14 PRIOR TO ANY WORK COMMENCING ON-SITE, THE APPLICANT SHALL SUBMIT TO THE BOARD PROOF THAT A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) CONSTRUCTION GENERAL PERMIT IS ACTIVE FOR THE PROJECT.

1.15 COPIES OF ALL INFORMATION AND ALL REQUIRED REPORTS REGARDING A US EPA NPDES PERMIT AND STORMWATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE FORWARDED TO THE BOARD VIA ELECTRONIC COPY.

1.19 THE APPLICANT SHALL RETAIN A QUALIFIED PROFESSIONAL ENGINEER TO OVERSEE THE INSTALLATION OF THE STORMWATER SYSTEM. A STORMWATER MITIGATION REPORT SHALL BE SUBMITTED TO THE BOARD WITHIN TEN (10) DAYS OF THE COMPLETION OF THE INSTALLATION OF THE STORMWATER MANAGEMENT SYSTEM. SUCH STORMWATER MITIGATION REPORT SHALL INCLUDE AS-BUILT PLANS, PHOTOGRAPHS FROM INSTALLATION, AND A WRITTEN SUMMARY OF THE INSTALLATION OF THE STORMWATER MANAGEMENT SYSTEMS, AS WELL AS STORMWATER BEST MANAGEMENT PRACTICES (POROUS PAVEMENT, RAIN GARDENS, AND SIMILAR ELEMENTS) THROUGHOUT THE PROPERTY).

1.20 THE APPLICANT SHALL TREAT PLANTED AREAS WITHIN RESOURCE AREAS AND BUFFER ZONES ONLY WITH SLOW RELEASE NITROGEN FERTILIZER ONCE DURING THE INITIAL PLANTING YEAR. APPLICATION OF THIS FERTILIZER IS NOT PERMITTED WITHIN TWO DAYS BEFORE AND AFTER STORM EVENTS. LAWN FERTILIZER MAY ONLY BE APPLIED TWICE PER YEAR, ONCE IN THE SPRING AND ONCE IN THE FALL, WITH THE EXCEPTION OF THE INITIAL PLANTING YEAR. THIS SHALL BE A CONTINUING CONDITION IN PERPETUITY THAT SURVIVES THE EXPIRATION OF THIS PERMIT.

1.21 THE APPLICATION OF PLANT NUTRIENTS SHALL COMPLY WITH 330 CMR 31.00. NO OTHER HERBICIDES OR TREATMENT METHODS MAY BE UTILIZED ON THE PROPERTY UNLESS APPROVED AS PART OF THE APPROVED INVASIVE SPECIES MANAGEMENT PLAN. NO PESTICIDES OR RODENTICIDES SHALL BE USED TO TREAT PEST MANAGEMENT ISSUES WITHIN RESOURCE AREAS. THIS SHALL BE A CONTINUING CONDITION IN PERPETUITY THAT SURVIVES THE EXPIRATION OF THIS PERMIT.

1.22 EXCEPT AS SPECIFICALLY NOTED IN CONDITION I.5, THE APPLICATION OF SAND AND/OR SALT WITHIN THE ONE HUNDRED FEET (100') OF RESOURCE AREA IS PROHIBITED.

1.23 THE APPLICANT SHALL CONDUCT A THOROUGH CATCH BASIN SUMP CLEANING AT ALL PROTECTED CATCH BASINS AT THE END OF CONSTRUCTION OF THE PROJECT.

1.25 ALL PLANT SPECIES PLANTED AND INVASIVE SPECIES REMOVED THROUGH THE PROJECT SHALL BE MONITORED FOR THREE YEARS. A SURVIVAL RATE OF EIGHTY PERCENT (80%) MUST BE MAINTAINED FOR THE APPROVED PLANTING AT THE END OF THE THIRD YEAR OF MONITORING. IF THE SURVIVAL RATE IS LESS THAN EIGHTY PERCENT (80%) AFTER THE END OF THE THIRD YEAR, THE APPLICANT MUST SUBMIT PROPOSED RECOMMENDATIONS FOR REPLACEMENT TO THE BOARD FOR ITS REVIEW AND ADMINISTRATIVE APPROVAL. A MONITORING REPORT SHALL BE SUBMITTED ANNUALLY IN JUNE FOR EACH OF THE YEARS IN THE THREE-YEAR MONITORING PERIOD, REPORTING ON THE HEALTH OF THE NEW PLANTINGS AND THE SUCCESS OF THE INVASIVE PLANT MANAGEMENT. THE APPLICANT SHALL SUBMIT THE CONTACT INFORMATION OF THE PARTY RESPONSIBLE FOR MONITORING AND MAINTAINING THE PLANTED VEGETATION TO THE ZBA. SHOULD ANY CHANGES BE MADE TO THIS PARTY, THE ZBA SHALL BE NOTIFIED. THIS SHALL BE A CONTINUING CONDITION IN PERPETUITY THAT SURVIVES THE EXPIRATION OF THIS PERMIT.

1.26 NO WORK SHALL BE ALLOWED IN OR WITHIN TWENTY-FIVE FEET (25') OF ANY RESOURCES AREA EXCEPT AS SHOWN ON THE APPROVED PLANS.

1.27 NO DISTURBANCES SHALL BE ALLOWED IN OR WITHIN FIFTY FEET (50') OF ANY RESOURCE AREA, EXCEPT AS SHOWN ON THE APPROVED PLANS.

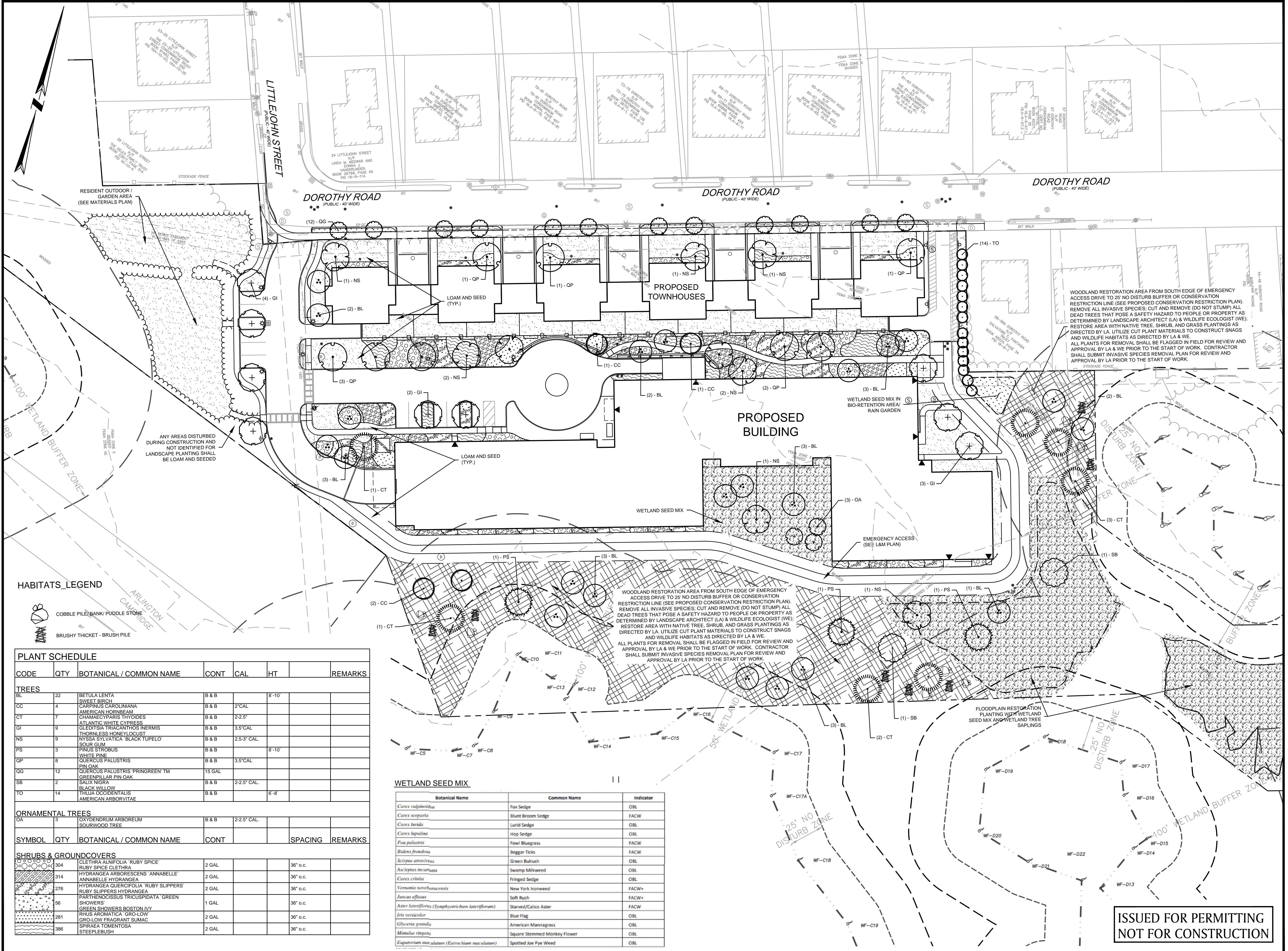
1.30 ANY BUILDING OR SITE Dewatering OPERATIONS SHALL CONFORM TO THE FOLLOWING:

1. THE APPLICANT SHALL NOTIFY THE CONSERVATION COMMISSION AND DPW THAT Dewatering IS REQUIRED PRIOR TO COMMENCING ANY Dewatering OPERATIONS.
2. ANY CATCH BASINS, DRAINS, AND OUTfalls TO BE USED IN Dewatering OPERATIONS SHALL BE CLEANED OUT BEFORE OPERATIONS BEGIN.
3. ANY WATER DISCHARGING AS PART OF ANY Dewatering OPERATION SHALL BE PASSED THROUGH FILTERS, ON-SITE SETTLING BASINS, SETTLING TANK TRUCKS, OR OTHER DEVICES TO ENSURE THAT NO OBSERVABLE SEDIMENTS OR POLLUTANTS ARE CARRIED INTO ANY RESOURCE AREA, STREET, DRAIN, OR ADJACENT PROPERTY. FILTERING IS ESSENTIAL TO REMOVE ANY AUTOMOTIVE POLLUTANTS FROM THE WATER PRIOR TO DISCHARGE.
4. MEASURES SHALL BE TAKEN TO ENSURE NO EROSION OR SCOURING SHALL OCCUR ON PUBLIC OR PRIVATE PROPERTY, OR ON THE BANKS OR BOTTOMS OF WATER BODIES, AS A RESULT OF Dewatering OPERATIONS. DISCHARGES ARE TO BE SET BACK AT LEAST FIFTY FEET (50') FROM BW AND IW.
5. Dewatering SHALL NOT TAKE PLACE IN ANY MANNER THAT LEADS TO WATER BEING DISCHARGED OR ALLOWED TO FLOW ONTO PROPERTY NOT UNDER THE CONTROL OF THAT PROPERTY OWNER.

ABBREVIATIONS

BC	BOTTOM OF CURB

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MASSACHUSETTS
Brenda R. Austin
REGISTERED LANDSCAPE ARCHITECT
NO. 1248

THORNDIKE PLACE
NOTICE OF INTENT

DOROTHY ROAD
IN
ARLINGTON
MASSACHUSETTS
(MIDDLESEX COUNTY)

PLANTING PLAN

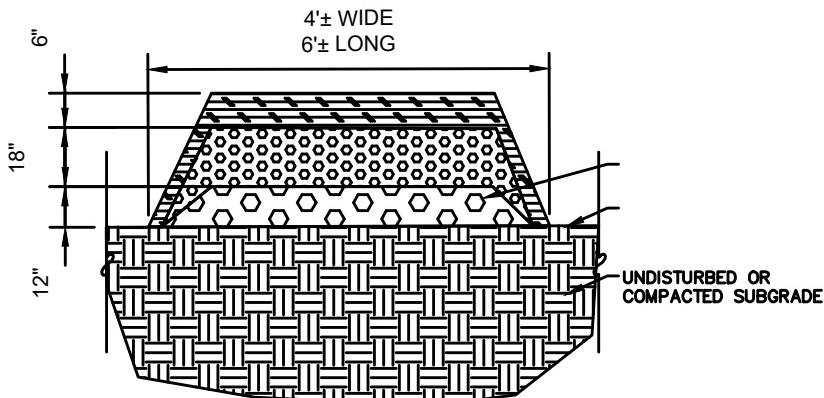
SEPTEMBER 6, 2023

REVISIONS:		
NO.	DATE	DESC.
1	02/07/24	REV. RESTORATION AREA

PREPARED FOR:
ARLINGTON LAND REALTY, LLC
84 SHERMAN STREET, 2ND FLOOR
CAMBRIDGE, MA

BSC GROUP
860 Brattle Street, Suite, 203
Cambridge, Massachusetts 02130
617 896 4300
© 2023 BSC Group, Inc.
SCALE: 1" = 30'
0 15 30 60 FEET
FILE: \Civil\Drawings\2340700-LM
DWG.: JOB. NO: 23407.02 SHEET L-100

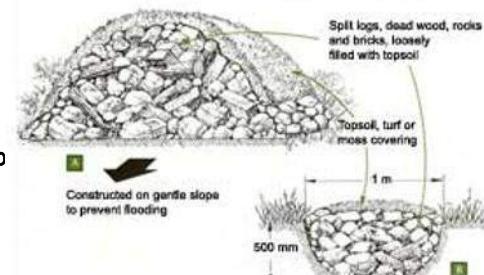
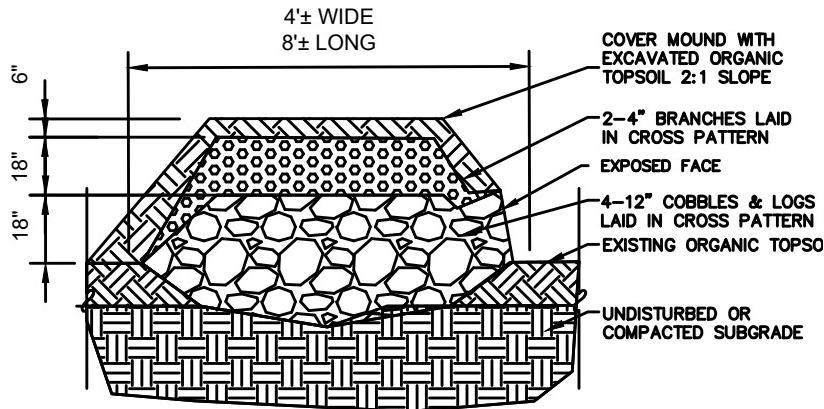
NOTES:
 THICKET BRUSH PILE SHALL CONSIST OF WOODY MATERIAL CLEARED FROM THE SITE CUT TO SIZE AND PLACED AS DIRECTED.
 BRUSH MAY NOT INCLUDE INVASIVE WEED SEED. REVIEW MATERIAL TO BE SET ASIDE FOR BRUSH PILE WITH DOT WETLAND
 SPECIALIST OR LANDSCAPE ARCHITECT.
 LOCATIONS OF WILDLIFE HABITATS WILL BE CONFIRMED BY LANDSCAPE ARCHITECT ON SITE.



HABITAT: BRUSHY THICKET – BRUSH PILE

SCALE: NONE

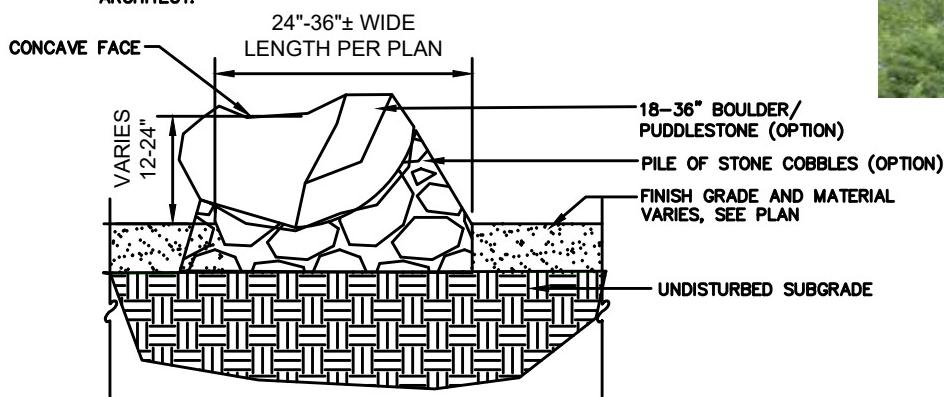
NOTES:
 HIBERNACULA SHALL CONSIST OF STONE & WOODY MATERIAL CLEARED FROM THE SITE CUT TO SIZE AND PLACED AS DIRECTED.
 BRUSH MAY NOT INCLUDE INVASIVE WEED SEED. REVIEW MATERIAL TO BE SET ASIDE FOR BRUSH PILE WITH WETLAND SPECIALIST OR
 LANDSCAPE ARCHITECT.



HABITAT: HIBERNACULA – EARTH, STONE, WOOD PILE

SCALE: NONE

NOTES:
 COBBLES SHALL BE ROUNDED FIELD STONE 12" MAX. DIA. 3" MIN. DIA.
 THE CONTRACTOR MAY UTILIZE STONE REMOVED FROM THE CONSTRUCTION
 EXCAVATIONS FOR USE IN HABITAT COBBLE PILE.
 PLACE COBBLE PILES AS DIRECTED BY THE DOT WETLAND SPECIALIST OR LANDSCAPE
 ARCHITECT.



HABITAT COBBLE PILE/ BANK/ PUDDLE STONE

SCALE: NONE



Town of Arlington, Massachusetts

DEP #091-0278: Amendment to Order of Conditions: 88 Coolidge Road (Continued from 12/21/2023)

Summary:

This public hearing will consider the peer review report for an amendment to an Order of Conditions for construction of a new house at 88 Coolidge Road in the Buffer Zone to a Bordering Vegetated Wetland.

ATTACHMENTS:

Type	File Name	Description
□ Reference Material	88_Coolidge_Peer_Review_by_Nobis_Engineering.pdf	88 Coolidge Peer Review by Nobis Engineering
□ Reference Material	88_Coolidge_Rd_-_email.pdf	88 Coolidge Rd - email

12/15/23

Nobis Group, consultant to the Town of Arlington, Massachusetts Conservation Commission, offers the following notes, in italics with yellow highlighting, to the Applicant's November 2023 comment responses, shown below in blue-green highlighting.

Brien Waterman, P.E., Director of Structural Engineering for Nobis reviewed "GSAPlan 10.1" received by Nobis in November 2023, and stated, "From a geotechnical standpoint, the plan appears suitable. They added drains to protect below grade spaces and to protect the concrete slabs."

Sean McDowell, P.E., Nobis Civil Engineer, also reviewed "GSAPlan 10.1" and offered several comments on the plan, attached.

James H. Vernon, Ph.D., Senior Hydrogeologist

Mary Trudeau
Wetlands Consultant
141 Lowell Street
Lexington, Massachusetts 02420

781-424-4768
marytrudeau@ymail.com

November 1, 2023

Arlington Conservation
Commission Town Hall
Arlington, MA

Re: 88 Coolidge Road, Arlington, MA
Amendment to Order of Conditions (91-278)

To the Commission:

Please find the attached responses to the September 19, 2023 comments generated by the Nobis review of the proposed amendment to the Order of Conditions for 88 Coolidge Road. These updated, responses were prepared by Chad Smurtzer, PE (Structural Engineer); Alfred Taney, PE (Geotechnical Engineer); Albert Gala, PE (Civil Engineer), and are highlighted in blue.

Question 1: Regarding the AAT Letter report dated 2/14/23: The applicant recommends cleaning the bedrock and then pinning the house foundation to the bedrock. What does "cleaning" entail? Does this involve actual removal of rock? What is your engineer's professional opinion on the likelihood that such cleaning might release confined water flow from the top surface or shallow fractures in the rock, causing upwelling of water?

The process of pinning requires drilling holes into the rock, which will create dust and small debris, which must be cleaned away from the surface of the bedrock—this is the cleaning referred to in the requested amendment. The cleaning could be performed with a garden hose to remove

loose dirt so the rock surface can be observed where pinning will occur. The likelihood of the cleaning process causing upswelling is unlikely since the process can be performed with low pressure garden hoses or brushes and buckets of water. High pressure power washing is not recommended.

Nobis Note: Nobis recommends accepting this response.

Question 2: Regarding the Foundation Plan by C. Smutzer, P.E., dated 1/13/23, the notes in the center of the drawing state that the foundation is “assumed to rest entirely on bedrock.” The top surface of the bedrock at the site is known to be very irregular. This means that significant bedrock removal would be needed to accomplish this. Do you agree with this conclusion?

No—foundations are often poured on irregular bedrock—that is the reason for the pinning requirement to allow the foundation to be poured on irregular or sloped bedrock. The bedrock does not have to be flat. The bedrock must be stable, however, and all loose or shattered material must be removed.

Nobis Note: Nobis’ July 24, 2017 letter report to the Town of Arlington noted (pg 4 & pg 11) that six test holes at the site reached “refusal” at depths ranging from 30 to 63 inches. The Nobis report further noted that “refusal” does not necessarily mean that the top of bedrock was reached (could be deeper). Nobis concluded, at that time, that “a degree of uncertainty in the configuration of the bedrock surface is still present.” Nobis now recommends that the Town ask the following questions:

1. Have there been any alterations to the top of the bedrock surface since 2017? YES Please attach a plan that shows the areas where top of bedrock has been altered and contours of the present top of bedrock surface.
2. Is there any new information (borings, test pits, other observations) regarding the three-dimensional configuration of the bedrock surface, acquired since 2017? YES Please attach or reference a document submitted to the Commission in 2023 that provides this information.
3. Based on answers to these two questions, does the Applicant believe that a foundation can be poured on the irregular bedrock at 88 Coolidge, as the bedrock surface is currently configured and characterized? Yes, providing that all loose and shattered material is removed.

Nobis Notes (December 2023): See notes regarding items 1 and 2, above. Regarding item 3, how much loose and shattered material needs to be removed? Is this a minor cleanup, or is excavation that will change the elevation or configuration of the current excavation required?

Question 3: Regarding the same drawing, AAT mention “cleaning” of bedrock but not removal. Is the foundation resting entirely on bedrock consistent with what is proposed by AAT? What risks might be posed by removing significant amounts of bedrock; might this cause groundwater upwelling?

From a structural standpoint, only the loose bedrock is required to be removed—it does not have to be level but is required to be stable with no shattered material. It is my understanding that no more intact/competent rock will be removed and therefore it is unlikely that upswelling will occur.

Nobis Note: Nobis suggests that the Town ask the following questions:

4. Can the Applicant confirm, considering the answer to the questions above, that no more intact/competent rock will be removed? Only loose or shattered material is proposed to be removed.

Nobis Notes (December 2023): See note 3, above.

5. Has the Applicant made observations after large rain or snowmelt events that confirm that no upwelling of water occurs at the site under current conditions? Yes. The applicant has provided the Conservation Commission with 38 reports, over the past year, prepared in response to significant precipitation or snow melt events. There have been no observations of upswelling, or groundwater breakout noted on the property, nor has there been any observation of groundwater flow through the Coolidge Road bedding. The site has shown little, if any, retention of stormwater after significant rain events, and infiltration is rapid across the lot.

Nobis Notes (December 2023): Given that the Commission has received the 38 reports (Nobis has not reviewed) and finds nothing to dispute the conclusion, Nobis recommends accepting this response.

Question 4: Regarding the March 19, 2023 letter from Mary Trudeau, Wetland Consultant, how do you know how deep the weathered, poor quality bedrock in the southwest corner of the proposed foundation extends?

While this cannot be definitively answered without the removal of the loose and/or weathered/cracked portions of the surficial ledge, and the subsequent exposure of stable bedrock, the intent is to remove limited amounts of weathered stone. Often the bedrock stabilizes below grade as it is the exposure to weather which can cause the loosening and cleavage. Based on our initial visual assessment, the amount of material to be removed is estimated at a cubic yard.

Nobis Notes (December 2023): The applicant acknowledges a degree of uncertainty; Nobis believes that the probability of needing to remove a large quantity of weathered rock or excavating to significant depth is low. Nobis recommends that the Commission have an observer on site when this is done and/or require photo or video documentation.

6. Is support of excavation (e.g. sheet piling) anticipated to excavate to top of competent bedrock?

It is anticipated that competent bedrock is not at a depth requiring excavation support.

Nobis Notes (December 2023): Response accepted on the condition that the Commission be informed and provided the opportunity to comment if competent bedrock is deeper than anticipated and requires excavation support.

Based on the Foundation Plans, dated 1/13/2023, Gravel Base is required below the proposed concrete slab. What is the minimum thickness of Gravel Base below the slab? If bedrock is locally shallow in the area of the slab, what is the plan for removal of bedrock? The minimum thickness of the gravel base is 12" (twelve inches). Based on current observations, bedrock does not appear to be locally shallow in the area of the slab, and will not require removal.

Nobis Notes (December 2023): Do site conditions allow emplacement of at least 12 inches of gravel without significant bedrock removal? Is this the case even in the area where the poured foundation is proposed to step up, due to shallow bedrock configuration?

Question 5: What if you have to extend the excavation deeper than the intended grade? Will you then remove more bedrock to lower a larger area down to the southwest corner's grade or will you emplace fill in the low area to even out the excavation? If so, how will this affect drainage?

If the bedrock removal needs to go below grade, engineered fill can be used to backfill the work area. We are looking for either a level surface or stable bedrock to ensure a solid foundation. It is our understanding that no more intact rock removal will occur, and that the removal of weathered or exposed ledge will be the extent of the alterations. The drainage installed on the property to control hydrostatic pressures and runoff shall be designed by the Site Civil Engineer.

Nobis Note: Nobis recommends that the Town should be provided with an opportunity to review the drainage design by the Site Civil Engineer. A drainage design has been attached to this response

Nobis Notes (December 2023): See notes in red on the attached drainage design plan.

Based on the Foundation Plan, dated 1/13/2023, the foundation is assumed to rest entirely on bedrock. The above response appears to indicate that portions of the footing can be placed over engineered fill. Confirm if portions of the footing can be placed over engineered fill. Typically, placing a portion of a footing on bedrock and a portion over fill has the potential to result in undesirable differential settlement.

The engineered fill will be placed in compacted lifts to increase bearing capacity, and isolation joints will be installed at any transition points.

Nobis Notes (December 2023): Nobis has no further comment on this item.

Question 6: In the AAT letter (2/14/23), AAT recommends that pinning the foundation to bedrock should be conditioned on inclusion of a foundation drain system to be designed by a Civil Engineer. Mary, do you agree with AAT's recommendation? Can you please explain who on the team will be designing the foundation drain?

A perimeter drain around the foundation will be required as per the building code, and designed by a Registered Professional Engineer. The perimeter drain will connect the outflow water from the subsurface drainage systems, at different elevations and route it to a new area of crushed stone below the deck/patio. It is expected the pinned foundation walls will have

below surface weep holes to allow drainage from behind the walls to drain into the perimeter drain.

Nobis Note: Nobis recommends that the Town accept this response but be provided with an opportunity to review the drainage design by the Site Civil Engineer.

A perimeter drain plan is attached to this response.

Nobis Notes (December 2023): Please see separate mark-up of "GSAPlan 10.1" by Nobis Civil Engineer, Sean McDowell, P.E.

Thank you for the opportunity to respond to the Nobis comments. Feel free to contact me with any questions.

Sincerely,

A handwritten signature in black ink that reads "Mary Trudeau".

Mary Trudeau, Wetlands Consultant

Re: 88 Coolidge Road

Mary Trudeau <marytrudeau@ymail.com>

Tue 2/6/2024 6:24 PM

To:Ryan Clapp <rclapp@town.arlington.ma.us>;Susan Chapnick <s.chapnick@comcast.net>;Chuck Tirone <ctirone@ci.reading.ma.us>

Cc:Jonathan Nyberg <jonathannyberg@oldnewenglandproperties.com>

1 attachments (2 MB)

88 Coolidge Peer Review by Nobis Engineering.pdf;

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Hi Ryan,

We have answers for most, if not all of the Nobis issues, and can send them to you this week. We were trying to deliver a complete response, but are happy to submit a partial response, and hopefully resolve these issues.

Mary

On Tuesday, February 6, 2024 at 04:14:47 PM EST, Ryan Clapp <rclapp@town.arlington.ma.us> wrote:

Good afternoon,

Unfortunately, I cannot provide a recommendation for a mounding analysis for 88 Coolidge Road, and Nobis, Susan, Chuck and I are concerned about a conflict of interest in having them perform the work or having them provide additional contacts - what the Engineering Department has provided is likely the best list of local engineers, but there may be others. It is unfortunate that these firms have been unable to perform the work requested.

However, in the meantime, based on the attached report it appears that there are additional outstanding items. Are you able to address those, so that we can keep moving forward on other items?

Ryan Clapp
Conservation Administrator

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